REPORT, RETURNS AND STATISTICS

OF THE

INLAND REVENUES

OF THE

DOMINION OF CANADA

FOR THE FISCAL YEAR ENDED JUNE 30

1900

PART III

ADULTERATION OF FOOD

PRINTED BY ORDER OF PARLIAMENT

OTTAWA
PRINTED BY S. E. DAWSON, PRINTER TO THE QUEEN'S MOST EXCELLENT MAJESTY
1901

[No. 14 —1901.]

CONTENTS.

REPORT

OF THE

COMMISSIONER OF INLAND REVENUE.

INSPECTION OF FOODS, DRUGS AND FERTILIZERS.

To the Honourable
The Minister of Inland Revenue.

SIR,—I have the honour herewith to submit the report of the official analysts of the Dominion for the fiscal year ended June 30, 1900.

The following is a summary statement of the whole number of samples analysed by them :—

Description of Sample.	Genuine.	Adulterated.	Doubtful.	Total.
Olive oil	38	24	5	67
Condensed milk	131	4	10	145
Baking powder	32	46	.....	78
Cloves	27	15	5	47
Scotch whiskey	19	.....	9	28
Pepper	56	21	.....	77
Native wine	34	32	11	77
Corn	3	.....	.....	3
Spirits of camphor	9	5	.....	14
Cocoa and chocolate	32	3	2	37
Fertilizers	60	8	2	70
Cream of tartar	43	12	2	57
Honey	16	6	.....	22
Salt	16	2	.....	18
Saltpetre	2	8	.....	10
Hop beer	6	.....	.....	6
Total	524	186	46	756

There does not appear to be any feature calling for special comment, beyond the remarks made by individual analysts and the Chief Analyst.

I have the honour to be, sir,
Your obedient servant,

EDWARD MIALL,
Commissioner.

INLAND REVENUE DEPARTMENT,
OTTAWA, January 4, 1901.
14—1

REPORT OF CHIEF ANALYST.

JANUARY 2, 1901.

The Commissioner of Inland Revenue,
Ottawa.

SIR,—In view of the early publication of the Adulteration of Food Report for the fiscal year ended June 30, 1900, I beg to remind you of the recommendations which have been made, from time to time, regarding the establishment of standards of quality for, and limits of variability permissible in certain articles of food, with the object of obtaining action by the Governor in Council under section 19 of the Adulteration Act. Of course those recommendations have no reference to agricultural fertilizers, the standards of which are fixed by the Fertilizers Act, nor to drugs which are regulated by the British Pharmacopœia, nor to those articles whose qualities are defined under the Act in restraint of fraudulent marking.

MILK.

Whole milk shall not contain less than 3·5 per cent butterfat, 8·5 per cent non-fatty solids, and 12 per cent total solids.

COFFEE.

When coffee is sold as a mixture or compound it shall consist only of chicory and coffee; the proportion of the former not to exceed 20 per cent.

LARD

When sold as a compound it shall not contain more than 10 per cent of beef tallow.

BAKING POWDER

Shall not contain more than 20 per cent starch or flour, and be entirely free from substances containing alumina.

BUTTER

Shall not contain more than 15 per cent water, 5 per cent salt and 2 per cent curd.

MUSTARD.

The genuine article shall not contain less than 30 per cent of fixed oil, and the compound or mixture, not less than 22 per cent.

PEPPERS

Shall not contain more than 8 per cent ash.

MOLASSES

Shall not contain less than 40 per cent cane sugar.

SYRUPS

Shall not contain less than 35 per cent cane sugar.

Brandy

Shall not contain less than 48 per cent by volume of alcohol, and not more than 0·2 per cent total solids.

Rum

Shall not contain less than 48 per cent by volume of alcohol.

Whiskey

Shall not contain less than 48 per cent by volume of alcohol, and not more than 0·2 per cent total solids.

Hollands and Old Tom.

These liquors shall not contain less than 48 per cent by volume of alcohol.

Vinegar

Shall not contain less than 3 per cent acetic anhydride, or 3·5 per cent of glacial acetic acid.

Wine

Shall be produced by alcoholic fermentation from the juice of fresh grapes only, without any addition of foreign sugar or alcohol.

Beer

Shall be prepared by alcoholic fermentation from barley-malt, hops, yeast and water only.

Dr. John Baker Edwards, who was appointed District Analyst in Montreal, on the 1st July, 1875, died on the 15th January, 1900. The following is a statement of the food samples submitted to him for examination from the 1st July, 1899, until the time of his death.

Description of Samples.	Genuine.	Adulterated.	Doubtful.	Total.
Olive oil	6	4	1	11
Condensed milk	22	.....	.....	22
Baking powder	3	8	.....	11
Cloves	8	3	.....	11
Pepper	5	6	.....	11
Native wine	.....	10	1	11
Total	44	31	2	77

I have the honour to be, sir,

Your obedient servant,

THOMAS MACFARLANE,

Chief Analyst.

REPORTS OF PUBLIC ANALYSTS.

LABORATORY OF THE OFFICIAL ANALYST FOR
NOVA SCOTIA AND PRINCE EDWARD ISLAND,
66, BEDFORD ROW,
HALIFAX, N.S., October 25, 1900.

The Commissioner of Inland Revenue,
Ottawa.

SIR,—I have the honour to submit my report on the samples of food, &c., analysed by me under the Adulteration Act, during the year ending June 30, 1900.

Samples.	Genuine.	Adulterated.	Doubtful.	Total.
Condensed milk	20			20
Olive oil	7	1	2	10
Baking powder	9	2		11
Cloves	5		5	10
Pepper	9	1		10
Wine		10		10
Hop beer	6			6
Honey	11	5		16
Cream of tartar	10			10
Total	77	19	7	103

I have the honour to be, sir,
Your obedient servant,

MAYNARD BOWMAN.

QUEBEC ANALYST'S ANNUAL REPORT. July 1, 1899, to June 30, 1900.

Kind of Sample.	Number.	Genuine.	Doubtful.	Adulterated.	Sold as compound
Olive oil— (July, 1899)	10	6	0	4	0
Condensed milk— (August, 1899)	10	7	3	0	0
Baking powder— (September, 1899)	10	1	0	9	0
Cloves— (October, 1899)	10	7	0	3	0
Pepper— (November, 1899)	10	6	0	4	0
Native wine— (December, 1899)	10	0	10	0	0
Condensed milk— (January, 1900)	11	8	3	0	0
Cocoas and Chocolate— (February, 1900)	9	7	2	0	0
Fertilizers— (April, 1900)	11	10	0	1	0
Fertilizers— (May, 1900)	10	8	0	2	0
Cream of tartar— (June, 1900)	11	10	0	1	0
Totals	112	70	18	24	0

NOTE.—The work done in March, 1900, was on the Standard Fertilizers,—eleven samples.

DR. M. FISET, M.D.,
Public Analyst.

LABORATORY, Quebec, July 24, 1900.

OTTAWA, August 22, 1900.

To the Commissioner of Inland Revenue,
Ottawa.

SIR,—I have the honour of submitting to you my report for the past year. I have examined in all 110 samples as shown in the following table :—

Samples.	Genuine.	Adulterated.	Doubtful.	Total.
Olive oil	4	3	2	9
Condensed milk	15	3		18
Whiskey	2		7	9
Baking powder	4	5		9
Pepper	5	4		9
Wine	5	4		9
Corn	3			3
Cocoa and chocolate	7			7
Spirits of camphor	9			9
Fertilizers	8	2		10
Common Salt	7	2		9
Cream of tartar	6	1	2	9
Total	75	24	11	110

I have the honour to be, sir,
Your obedient servant,

F. X. VALADE, M.D.,
Public Analyst.

SCHOOL OF PRACTICAL SCIENCE,
TORONTO, November 1, 1900.

SIR,—I beg to submit herewith my annual report on the work done on the samples analysed in my laboratory during the year 1899–1900.

During this year 118 samples of food have been examined, inclusive of fertilizers, with the results shewn in the following table :—

Samples.	Total.	Genuine.	Adulterated.	Doubtful.	Remarks.
Olive oil	10	6	4		
Condensed milk	20	17		3	Fat below average.
Scotch whiskey	10	10			
Baking powder	10	4	6		4 alum phosphate and 2 alum baking powder.
Pepper	10	10			1 pepper was marked "compound" and 2 "compounds" were dirty.
Native wine	10	10			
Cocoa and chocolate	8	8			
Fertilizers	20	18		2	1 below guarantee in potash, 1 below standard in available P_2O_5. 4 no guarantee.
Saltpetre	10	2	8		6 were sodium nitrate, 2 were mixed sodium and potassium nitrate.
Cream of tartar	10	10			
Total	118	95	18	5	

I have the honour to be, sir,
Your obedient servant,

W. H. ELLIS.

OFFICE OF PUBLIC ANALYST,
LONDON, June 30, 1900.

To the Commissioner of Inland Revenue,
Ottawa.

SIR,—I have the honour to present a tabulated statement of result of the analyses of samples, submitted to me by the Department during the past year :—

Samples.	Genuine.	Adulterated.	Doubtful.	Total.
Olive oil	5	4		9
Condensed milk	16		1	17
Scotch whiskey	7		2	9
Spirit of camphor		5		5
Baking powder	2	7		9
White pepper	4	5		9
Native Canadian wine	1	8		9
Honey	5	1		6
Cocoa		3		3
Chocolate	3			3
Fertilizers	8	1		9
Salt	9			9
Cream of tartar	1	8		9
Total	61	42	3	106

I have the honour to be, sir,
Your obedient servant,

FRANKLIN T. HARRISON.

SCHOOL OF PRACTICAL SCIENCE,
TORONTO, November 1, 1900.

SIR,—I beg to submit herewith my annual report on the work done on the samples analysed in my laboratory during the year 1899–1900.

During this year 118 samples of food have been examined, inclusive of fertilizers, with the results shewn in the following table :—

Samples.	Total.	Genuine.	Adulterated.	Doubtful.	Remarks.
Olive oil	10	6	4		
Condensed milk	20	17		3	Fat below average.
Scotch whiskey	10	10			
Baking powder	10	4	6		4 alum phosphate and 2 alum baking powder.
Pepper	10	10			1 pepper was marked "compound" and 2 "compounds" were dirty.
Native wine	10	10			
Cocoa and chocolate	8	8			
Fertilizers	20	18		2	1 below guarantee in potash, 1 below standard in available $P_2 O_5$. 4 no guarantee.
Saltpetre	10	2	8		6 were sodium nitrate, 2 were mixed sodium and potassium nitrate.
Cream of tartar	10	10			
Total	118	95	18	5	

I have the honour to be, sir,
Your obedient servant,

W. H. ELLIS.

OFFICE OF PUBLIC ANALYST,
LONDON, June 30, 1900.

To the Commissioner of Inland Revenue,
Ottawa.

SIR,—I have the honour to present a tabulated statement of result of the analyses of samples, submitted to me by the Department during the past year :—

Samples.	Genuine.	Adulterated.	Doubtful.	Total.
Olive oil	5	4		9
Condensed milk	16		1	17
Scotch whiskey	7		2	9
Spirit of camphor		5		5
Baking powder	2	7		9
White pepper	4	5		9
Native Canadian wine	1	8		9
Honey	5	1		6
Cocoa		3		3
Chocolate	3			3
Fertilizers	8	1		9
Salt	9			9
Cream of tartar	1	8		9
Total	61	42	3	106

I have the honour to be, sir,
Your obedient servant,

FRANKLIN T. HARRISON.

ST. JOHN'S COLLEGE,
WINNIPEG, CANADA, June 30, 1900.

The Commissioner of Inland Revenue,
Ottawa.

SIR,—I have the honour to present a tabulated statement showing the general results of the examination of samples submitted to me by the Department during the year ending June 30, 1900:—

Samples.	Genuine.	Adulterated.	Total.
Condensed milk	18	1	19
Olive oil	4	4	8
Baking powder	1	9	10
Cloves	3	7	10
Pepper	10	0	10
Wine	10	0	10
Cocoa and chocolate	7	0	7
Cream of tartar	6	2	8
Fertilizers as sold	8	2	10
Total	67	25	92

I have the honour to be, sir,
Your obedient servant,

EDGAR B. KENRICK.

SESSIONAL PAPER No. 14

PUBLIC ANALYST'S OFFICE,
VICTORIA, B.C., November 3 1900.

To the Commissioner of Inland Revenue,
Ottawa.

SIR,—I beg to submit report for year ending June 30, 1900 :—

Samples.	Genuine.	Adulterated.	Total.
Baking powder	8	0	8
Cloves	4	2	6
Pepper	7	1	8
Wine	8	0	8
Condensed milk	8	0	8
Total	35	3	38

I have returned baking powders as genuine although six were "alum phosphate powder." I am satisfied I made a mistake, and will in future return such powders as adulterated, as I am convinced they are harmful.

I have the honour to be, sir,
Your obedient servant,

C. J. FAGAN.

64 VICTORIA, A. 1901

APPENDIX A.—INSPECTION OF

Date of Collection.	Description of Sample, Name and Address of Manufacturer and Furnisher, as given by Vendor.	No. of Analyst's Certificate.	No. of Sample.	Result of Analysis: Specific Gravity.	Water.	Cane Sugar.	Reducing Sugar as Lactose.	Total Ash.	Casein.
1899.	*Official Analyst, M. Bowman, Halifax, N.S.*				p. c.	p. c	p. c.	p. c.	p. c.
July 18	"Mayflower," Truro Condensed Milk and Canning Co., Truro, N.S.	12714	17667	1·283	30·67	36·89	13·20	1·94	8·06
" 18	"Red Star," Canada Milk Condensing Co., Antigonish, N.S.	12715	17668	1·282	30·50	37·42	13·48	1·80	8·18
" 26	"Reindeer," Truro Condensed Milk Co..	12716	17670	1·307	26·64	40·21	13·26	1·95	8·25
" 26	"Red Star," Canada Milk Condensing Co.	12717	17671	1·288	30·33	36·51	14·13	1·96	8·12
" 28	"Reindeer," Truro Condensed Milk Co ..	12718	17673	1.293	29·57	40·56	11·91	1·93	7·50
" 19	" " " .	12709	16728	1·295	26·00	41·47	13·51	1·99	7·50
" 19	"Beaver" " " ..	12710	16729	1·319	29·08	41·09	14·89	1·86	7·69
" 21	"Milkmaid," Anglo-Swiss Condensed Milk Co.	12711	16730	1·312	26·05	40·55	15·68	2·10	6·31
" 21	"Owl," Canada Milk Condensing Co., Antigonish, N.S.	12712	16731	1·293	31·71	32·80	18·03	1·60	8·37
" 22	"Mayflower," Truro Condensed Milk Co.	12713	16732	1·308	27·98	42·70	13·56	1·89	7·87
	Official Analyst, Dr. M. Fiset, Quebec.								
" 13	"Export," Baldwin Condensed Milk Co..	10158	19554	1·301	28·90	31·89	19·90	1·49	8·62
" 13	"Reindeer," Truro Condensed Milk Co..	10159	19555	1·292	30·80	29·92	19·50	1·92	8·56
" 13	"Canadian," Baldwin Condensed Milk Co.	10160	19556	1·291	32·85	32·34	18·19	2·02	8·00
" 13	"Owl," Canadian Milk Condensing Co...	10161	19557	1·301	27·30	37·77	13·90	1·93	8·75
" 13	"Mayflower," Truro Condensed Milk Co.	10162	19558	1·294	29·60	38·70	13·13	2·12	8·25
" 13	"Highland," Helvetia Milk Condensing Co.	10163	19559	1·086	67·90	None.	12·50	1·75	8·31
" 14	"Eagle," New York Condensed Milk Co.	10164	19560	1·306	28·00	39·85	12·86	1·63	8·06
" 14	"Nestles," H. Nestle, Switzerland	10165	19561	1·305	26·05	37·83	14·77	1·85	8·50
" 14	"Export," Baldwin Condensed Milk Co..	10166	19562	1·307	28·60	40·22	12·68	1·57	8·03
" 14	"Canadian" " "	10167	19563	1·295	27·80	38·18	13·47	1·65	8·55
	Official Analyst, Dr. J. B. Edwards, Montreal.								
" 10	"Reindeer," Truro Condensed Milk Co .	15616	19530	1·289	29·81	38·12	12·31	1·90	7·01
" 10	"Owl," Canada Milk Condensing Co	15617	19531	1·298	30·90	37·83	11·70	2·14	8·50
" 10	"Export," Baldwin Milk Condensing Co.	15618	19532	1·310	30·60	40·02	11·21	2·03	8·24
" 12	"Nestles," H. Nestle, Switzerland.....	15619	19533	1·314	28·23	39·04	13·23	2·02	8·27
" 12	"Eagle," New York Condensed Milk Co.	15620	19534	1·310	28·62	41·58	11·24	1·77	7·36
" 26	"Viking," Norwegian Milk Condensing Co.	15626	19535	1·104	66·66	1·47	12·38	2·06	8·56
" 26	"Jersey," Forrest Canning Co.....	15627	19536	1·330	29·20	41·78	12·64	1·86	7·19
" 26	"Milkmaid," Anglo-Swiss Condensed Milk Co.	15628	19537	1·312	27·82	39·11	12·68	2·05	8·01
" 26	"Mayflower," Truro Milk Condensing Co.	15629	19538	1·307	30·13	38·24	13·31	1·97	7·31
" 26	"Full Weight," Anglo-Swiss Condensed Milk Co.	15630	19539	1.330	27·03	40·63	13·65	1·98	7·60
" 27	"Reindeer," Truro Milk Condensing Co..	15631	19540	1·314	28·85	40·28	13·17	1·87	6·50
	Official Analyst, Dr. F. X. Valade, Ottawa								
Aug. 3	"Reindeer," Truro Milk Condensing Co..	14611	18442	1·294	27·80	41·32	10·06	1·65	9·83
" 3	"Eagle," New York Condensed Milk Co.	14612	18443	1·313	27·64	45·79	10·35	1·93	7·48
" 3	"Nestles," H. Nestle, Switzerland	14613	18444	1·323	26·70	42·20	12·29	1·73	8·98
" 3	"Export," Baldwin Condensed Milk Co..	14614	18445	1·295	28·39	38·96	11·80	1·77	7·40

SESSIONAL PAPER No. 14

CONDENSED MILK—Tabulated Statement.

Total Fat.	Concentration (volume).	Nitrogen.	Total Solids.	Remarks by Analyst.	Name and Address of Vendor of Sample.
p. c.		p. c.	p. c.		
9·24	3·40	.....	....	Genuine	F. Goddard, St. John, N.B.
8·62	3·44	.....	.....	"	G. W. & A. A. Barker, St. John, N.B.
9·69	3·50			"	H. B. Edwards, Moncton, N.B.
8·95	3·56	.....	.....	"	J. T. Ryan, Moncton, N.B.
8·50	3·16	.....	.....	"	Adams, Burns & Co., Bathurst, N.B.
9·53	3·40	.....	.....	"	A. F. Ross & Co., Truro, N.S.
5·40	3·68	.....	.....	"	G. & A. Barker, New Glasgow, N.S.
9·31	3·61	.....	.....	"	B. J. Hubley & Sons, Halifax, N.S.
7·46	4·14	.....	.....	"	W. E. Crowe & Co. "
7·89	3·48	.....	.....	"	A. L. Doyle & Co. "
9·20	4·47	.....	.....	Prepared from partly skimmed milk..	C. S. Riverin, Quebec.
9·30	4·47	.....	.....	" "	L. N. Bergeron "
6·60	4·15	.....	.....	" "	M. W. Coleman "
10·35	3.65	.....	.....	Genuine	A. J. Turcotte & Co., Quebec.
8·20	3·47	.....	.....	"	E. Paquet, Quebec.
9·80	2·77	.....	.....	"	A. W. Sanborn, Coaticook, P.Q.
9·60	3·30	.....	.....	"	" "
11·00	3·74	.....	.....	"	W. H. Fuller & Co., Sherbrooke, P.Q.
8·90	3·32	.....	.....	"	W. H. Griffith "
10·35	3·50	.....	.....	"	D. W. Stenson "
10·85	.....	.....	.....	Genuine and made from rich milk..	A. Trudeau, Montreal,
8·93	.....	.....	.....	Genuine	O. A. Bigaoutte, Montreal.
8·50	.....	.....	.....	"	P. Daoust, Montreal.
9·21	.....	.....	.....	"	R. Goold, St. Johns, N.B.
9·43	.....	.....	.....	"	Fraser & Viger, Montreal.
8·87	.....	.....	.....	"	Wm. Rourke "
7·33	.....	.....	.....	" but low in butter fat and high in cane sugar.	Barker & Co. "
10·33	.....	.....	.....	Genuine; rich in butter fat.....	G. Graham "
9·01	.....	.....	.....	"	T. A. Wood & Co. "
9·11	.....	.....	.....	"	E. Elliott "
9·33	.....	.....	.....	"	R. W. Williams, Three Rivers, P.Q.
8·76	3·08	.....	.....	Genuine, with addition of cane sugar.	Goodall Bros., Ottawa.
6·58	2·83	.....	.....	" "	H. F. MacCarthy, Ottawa.
7·80	3·32	.....	.....	" "	Jos. Kavanagh, Ottawa.
11·37	2·97	.....	.....	" "	Hudson & Powell "

APPENDIX A.—INSPECTION OF

Date of Collection.	Description of Sample, Name and Address of Manufacturer or Furnisher, as given by Vendor.	No. of Analyst's Certificate.	No. of Sample.	Result of				
				Specific Gravity.	Water.	Cane Sugar.	Reducing Sugar as Lactose.	Total Ash.	Casein.
1899.	*Official Analyst, Dr. F. X. Valade, Ottawa.*				p. c.	p. c.	p. c.	p. c.	p. c.
Aug. 3	"Canadian," Baldwin Condensed Milk Co.	14615	18446	1·314	28 39	41·88	13 67	1·85	7·43
" 4	"Reindeer," Truro Condensed Milk Co..	14616	18447	1·325	25·31	36 16	18·43	1·88	9·42
" 4	"Nestle's," H. Nestle, Switzerland.....	14617	18448	. .			.	....	. ..
" 4	"Export," Baldwin Condensed Milk Co..	14618	18449	1·332	26·23	42·66	11·32	2·22	8·03
" 4	"Canadian," Baldwin Condensed Milk Co.	14619	18450	1·314	25 03	43·96	13·53	0·96	7·66
	Official Analyst, Dr. W. H. Ellis, Toronto.								
July 13	"Export," Baldwin Condensed Milk Co..	12360	18423	.	29 14	37·76	12·39	1·77	8·23
" 13	"Reindeer," Truro Condensed Milk Co...	12361	18424		28·07	35 65	12·58	2·09	11 68
13	"Highland" (Evaporated Cream), Helvetia Milk Condensing Co.	12362	18425	.	71·15	None.	12·14	1·69	7·23
" 13	"Export," Baldwin Condensed Milk Co..	12363	18426		27 03	41 93	13·15	1·78	7·69
" 14	"Eagle," New York Condensed Milk Co	12364	18427	..	26 74	42 90	12·46	1·82	8 77
14	" "	12365	18428		27·19	43·20	10 48	1·72	9·55
" 14	"Milkmaid," Anglo Swiss Condensed Milk Co.	12366	18429	....	25 68	40·31	15·28	2·02	8 36
" 14	"Nestle's," H. Nestle, Switzerland	12367	18430	. ..	27·63	38·71	14 39	1·98	8·63
" 14	"Owl," Canada Milk Condensing Co.....	12368	18431	.	31·97	36 82	14·42	1·83	6·92
" 14	"Reindeer," Truro Condensed Milk Co..	12369	18432		29 64	39 81	11·48	1·94	8·45
	Official Analyst, F. T. Harrison, London, Ont.								
" 11	"Nestle's," H. Nestle.	14110	19260	..	27·20	40·23	13 04	1·83	7·72
" 11	"Allworth's," (Evaporated Cream), Canadian Condensed Milk Factory, Aylmer, Ont.	14111	19261	.	68·90	None.	11·95	1·85	9·10
" 12	"Full Weight," Anglo-Swiss Condensed Milk Co.	14112	19265	.	26·70	40·61	12·67	1·52	9·00
" 13	"Jersey," Forrest Condensed Milk Co., Halifax.	14113	19267	..	29·70	39 85	12·18	1·73	8 09
13	"Eagle," New York Condensed Milk Co.	14114	19268	.	28·40	42 37	10·46	1·81	8·36
" 13	"Leader," Michigan Condensed Milk Co.	14115	19270	. .	28 95	43·12	11 08	1·69	8·21
" 15	"Milkmaid," Anglo-Swiss Condensed Milk Co.	14116	19272	.	26·99	37·69	13·17	2·04	9·65
" 14	"Canadian," A. M. Smith & Co., London, Ont.	14117	19274	.	27·20	38·71	13·78	1·88	9·13
" 14	"Owl," Canada Milk Condensing Co., Antigonish, N.S.	14118	19276		30·45	39·79	10·83	1·82	8·63
	Official Analyst, Professor E. B. Kenrick, Winnipeg.								
Aug. 7	"Anglo-Saxon," The Canada Milk Condensing Co.	11301	17175	. . .	27 22	42·86	11·94	1·86	7·84
" 7	"Reindeer," Truro Condensed Milk Co...	11302	17176	..	28·74	40.15	12·03	1 86	8·25
7		11303	17177	.	28·07	40·17	12 57	1·87	8·29
7	"Export," Baldwin Condensed Milk Co .	11304	17178	. ..	27·03	39·19	12 55	1·82	8 57
7	"Jubilee," The Manitoba Dairy Co	11305	17179	. ..	32·52	33.74	14·58	1·86	9·72
7	"Mayflower," Truro Condensed Milk Co.	11306	17180		28·25	39·22	12·31	1·83	7·99
" 8	"Clover" "	11307	17181	. ...	28·47	43 16	12·22	1·85	8·15
" 8	"Duchess," Forrest Canning Co., Halifax, N.S.	11308	17182	...	31·82	44·45	12·59	1·86	8·85

SESSIONAL PAPER No. 14

CONDENSED MILK—Tabulated Statement—*Continued.*

Analysis.				Remarks by Analyst.	Name and Address of Vendor of Sample.
Total Fat.	Concentration (volume).	Nitrogen.	Total Solids.		
p. c.		p. c.	p. c.		
9·79	3·31	..	..	Genuine, with addition of cane sugar.	Kennedy & Co., Ottawa.
9·00	4·29	.....	...	Adulterated, being made out of partly skimmed milk	R. E. Hicks, Perth, Ont.
.....	.	....	.....	Too badly decomposed, black and bad odour, unfit for human food.	J. F. Kellock "
9·88	3·14	.....	..	Genuine, with addition of cane sugar.	W. Mooney, Ottawa.
8·50	3·18	.....	...	" "	W. H. Roger "
10·71	.	. .	.	Genuine	F. J. Morgan, Brockville.
9·94	...	.	.	"	John Culbert "
7·29	.	.	.	"	S. Hooey, Trenton, Ont.
8·45		..	...	"	" "
7·31		..	..	"	Jury & Gregory, Oshawa, Ont.
7·86	....	..		"	R. W. & A. Chambers, Oshawa, Ont.
8·35	...	..	...	"	J. Butcher, Toronto.
8·56	...	..	...	"	E. J. Lemaitre, Toronto.
8·04	...	..	...	"	Rossin House Grocery, Toronto.
8·68	...	..	...	"	W. McEwen, Hull, Que.
9·98	..	..	..	Genuine, with addition of cane sugar.	C. E. Nasmyth & Co., Stratford, Ont.
8·20	....	..	..	Genuine evaporated cream	A. Beattie & Co. "
9.50	..	..	..	Genuine, with addition of cane sugar.	J. Childs, London, Ont.
8·45	..	..	..	" "	F. H. Kaing, Windsor, Ont.
8·60	.....	..	..	" "	Duck & Hutton "
6·95		..	..	Made with milk much below average in fat.	A. Dougall "
10·55	..	..	..	Genuine, with addition of cane sugar. An excellent sample.	W. T. Strong, London, Ont.
9·30	..	..	..	Genuine, with addition of cane sugar.	Thornton Bros., Woodstock, Ont.
8·48	...	..	..	" "	Pool & Co. "
8·28	...	1·25	...	Genuine	Hodges & Co., Winnipeg.
8·97	...	1·32	....	"	W. R. Johnson "
9·03	....	1·33	....	"	E. E. Weldon & Co. "
10·84	.	1·37	....	"	Hunter, Kyle & Co. "
7·58	....	1·55	.....	"	Kenneth McKenzie & Co., Winnipeg.
10·40	.	1·28	...	"	" "
6·15	...	1·30	.....	"	E. Nicholson, Winnipeg.
0·43	.	1·42	.....	Adulterated. A solid cheese-like substance which will not mix with hot water. Made from skim milk.	A. Macdonald "

APPENDIX A.—INSPECTION OF

Date of Collection.	Description of Sample, Name and Address of Manufacturer or Furnisher, as given by Vendor.	No. of Analyst's Certificate.	No. of Sample.	Result of				
				Specific Gravity.	Water.	Cane Sugar.	Reducing Sugar as Lactose.	Total Ash.	Casein.
1899.	*Official Analyst, Dr. C. J. Fagan, Victoria, B.C.*				p. c.	p. c.	p. c.	p. c.	p. c.
July 21	"Owl," Canada Milk Condensing Co. ..	15033	20126	1·0523	42·06	31·50	9·29	..	6·87
" 21	"Imperial," Baldwin Mill Condensing Co.	15034	20127	1·0509	44·56	31·50	12·10	....	6·46
" 21	"Canadian" " "	15035	20128	1·0515	40·50	29·95	10·12		6·56
" 21	"Clover"	15036	20130	1·0551	34·50	40·89	9·36	...	8·75
" 21	"Milkmaid," Anglo-Swiss Condensed Milk Co.	15037	20131	1·0557	36·50	29·88	13·83	....	8·89
" 21	"Crescent" (Condensed Cream), Pacific Creamery Co., California.	15038	20135	1·0222	78·63	0·00	9·55	.. .	7·03
" 21	"Reindeer," Truro Condensed Mi k Co...	15039	20136	1·0533	39·50	37·77	11·30	.....	1·46
" 21	"Jersey Cream" " .	15040	20140	1·0253	75 50	0·25	10·93	..	7·36

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CONDENSED MILK—Tabulated Statement—*Concluded.*

Analysis.				Remarks by Analyst.	Name and Address of Vendor of Sample.
Total Fat.	Concentration (volume).	Nitrogen.	Total Solids.		
p. c.		p. c.	p. c.		
7·30					Blanchfield & Co., Vancouver, B.C
6·06					C. A. Ingram " "
8·12					Ford & Rogerson " "
8·62					Swait, Anderson, Bell & Co. "
8·62					G. W. Halliday. "
7·16					Parnell & Gunn, New Westminster, B.C.
7·38					Geo. Adams "
7·12					T. S. Annandale "

APPENDIX B.—INSPECTION OF CLOVES

Date of Collection.	Description of Sample, Name and Address of Manufacturer or Furnisher, as given by Vendor.	No. of Analyst's Certificate.	No. of Sample.	Result of Analysis.			
					Oil.		
				Moisture.	Volatile.	Non-volatile. Pet. : Ether Extract.	Fixed.
1899.	*Official Analyst, M. Bowman, Halifax.*			p. c.	p. c.	p. c.	p. c.
Sept. 6	Ground ; imported	12740	17677	10·72	14·48	.....	.....
" 6	" "	12741	17678	10·58	13 72	.	....
" 12	Whole "	12742	17680	11·05	19·63	..	.. .
" 14	Ground ; T. B. Barker & Son, St. John, N.B..	12743	17682	10·07	12·19	.....	.....
" 14	" A. F. Bandolph & Co., Fredericton, N.B.	12744	17683	10·89	19·32	.	... .
" 7	Whole ; Bowman & Angevine, St. John, N.B..	12745	16733	10·95	15·56	. . .	. ....
" 8	Ground ; not known.	12746	16736	11·22	12·00	..	. . .
" 11	Whole ; W. H. Schwartz & Son, Halifax, N.S.	12747	16738	11·80	16·89	...	....
" 11	Ground " "	12748	16739	10·75	11·32	. .	.
" 12	Whole " "	12749	16742	15·21	10·69	. .	.....
	Official Analyst, Dr. M. Fiset, Quebec.						
" 12	Whole	10180	19596	7 35	11·15	. . .	6·05
" 12	Ground ; M. Lefebvre & Co., Montreal	10181	19597	7·30	11·65	.	6·95
" 12	" Pure Gold Co	10182	19598	5·85	14·00	.....	6·36
" 12	"	10183	19599	10·10	11·55	. .	6·90
" 12	Whole.....	10184	19600	5·05	15·70	...	6·90
" 12	Ground . . .	10185	19601	6·00	14·00	.....	5·40
" 12	"	10186	19602	5·40	17·55	. . . .	6·70
" 12	Whole	10187	19603	8·20	15·25	. .	7·95
" 12	" Birks, Corner & Co., Montreal	10188	19604	8·05	12·90	....	7·30
" 12	Ground " . . .	10189	19605	7·60	7.50	.....	7·20
	Official Analyst, Dr. J. B. Edwards, Montreal.						
" 6	Ground.....	15637	19575	9·34	8·32		.....
" 6	. . . . .	15638	19576	6·68	14·71	..	.....
" 6	Whole . . .	15639	19577	9·95	9·35	..	. .
" 7	Ground ; Marrotte & Leblanc.....	15640	19578	10·98	5·27	...	.
" 7	Whole " "	15641	19579	10·99	8·51	. . .	.....
" 22	" H. M. Dinning, Montreal..... .	15650	19582	10 68	15·02	...	.....
" 20	"	15648	19580	10·08	16·00	.. .	.....
Oct. 5	" S. H. & A. S. Ewing, Montreal	15651	19583	8·62	15·03	...	.....
" 5	"	15652	19584	8·31	14·74	...	.
" 5	Ground . . .	15653	19585	12 09	7·13	..	. . .
" 5	" . . .	15654	19586	9·69	11·03	.	.
	Official Analyst, Prof. E. B. Kenrick, Winnipeg.						
Sept. 25	Whole.....	11327	17193	5·73	18·29	2·99	..
" 25	Ground	11328	17194	6·28	3·24	6·92	...
" 25	" The A. Macdonald Co., Winnipeg ...	11329	17195	6·32	15·33	3·31	.
" 25	Whole " "	11330	17196	6·76	16 95	2·93	.. .
" 25	Ground ; Hamilton Spice and Coffee Co .	11331	17197	6·34	11·42	3·35	.....
" 26	not known	11332	17198	6·70	11·32	3·27	.
" 26	Whole ; Sutherland & Campbell, Winnipeg ..	11333	17199	5·91	17·34	3·08	.. .
" 26	Ground ; G. F. & J. Galt, Winnipeg	11334	17200	5·82	11·70	3·23	..
.....	Whole ; Codville Co., Winnipeg...	11335	17201	6·39	17 86	2·97	..
Sept. 26	" Dyson, Gibson Co., Winnipeg.....	11336	17202	6 73	16·85	2·86	.....

(Whole and Ground)—Tabulated Statement.

Fat.	Ash.	Remarks by Analyst.	Name and Address of Vendor of Sample.
p. c.	p. c.		
....	6·83	Genuine	Canada Drug Co., St. John, N.B.
. .	6·49	Deficient in volatile oil	Bowman & Angevine "
.....	6·38	Genuine	H. McKenna, St. Stephen, N.B.
...	6·52	Deficient in volatile oil	W. R. Logan, Fredericton, N.B.
....	5·71	Genuine	John Gibson & Son "
.....	7·12	"	R. R. Bishop, Kentville, N.S.
.....	6·76	Deficient in volatile oil	Kirkpatrick & Dernont, Windsor, N.S.
....	6·02	Genuine	W. E. Crowe & Co., Halifax.
..	6·37	Deficient in volatile oil	A. M. Boutilier & Co. "
... .	6·26	" "	W. H. Drake "
.. ...	6·62	Found no foreign tissues, but sample contains some stems and dirt.	A. A. Cantin, Quebec.
.....	6·36	Adulterated with allspice	" "
.....	6·10	Genuine	W. Treggett "
.....	6·00	"	" "
.....	5·62	"	Fortier & Corriveau, Quebec.
.....	5·98	Some wheat starch present; adulterated slightly..	J. A. Moisan "
.. ...	6·40	Genuine	J. Picard "
.....	5·80	"	J. P. Guy "
.....	5·96	"	K. McRae, Richmond, Que.
.	5·82	Adulterated, much fibrous tissue and some stone cells present, probably from clove stems.	" "
2·03	7·06	Adulterated by removal of volatile oil and excess of moisture.	A. Sarazin, Montreal.
0·94	7·00	Genuine	Labrecque & Leclair, Montreal.
1·26	5·85	"	" "
3·73	8·85	Adulterated as being deficient in volatile oil, containing sand and millings and excess of moisture.	O. Voisard "
1·99	7·42	Genuine, but of low quality; moisture in excess.	" "
1·85	5·90	Genuine	J. Beaudoin "
2·55	6·60	"	J. Brodeur, St. Hyacinthe, Que.
2·78	6·99	"	A. A. Perry, Westmount, Que.
2·04	6·71	" clove stalks numerous	C. Morrison "
2·11	8·33	Contains foreign tissue, pimento, deal splinters, wheat straw and mustard husk; adulterated to the extent of 20 p.c. and upwards.	" "
1·61	5·84	Genuine	A. A. Perry "
.....	6·16	Genuine; contains 3·75 p.c. of stems	D. M. Sutherland, Boissevain, Man.
.....	4·09	Adulterated; sample appears to consist mainly or wholly of pimento.	" "
.....	5·69	Adulterated, being deficient in essential oil	John White "
.....	6·27	" sample contains 7·36 p.c. of stems	Hunter & Moore "
... ..	7·12	" being deficient in essential oil	" "
.....	6·89	" " "	E. Nicol & Son "
... .	6·22	Genuine; sample contains 1·38 p.c. of stems	A. Embree "
.	6·66	Adulterated, probably with stems; deficient in essential oil.	John Wootton, Manitou, Man.
.. .	5·71	Genuine; sample contains 2·39 p.c. of stems	P. Winram, Manitou, Man.
.....	6·38	Adulterated; sample contains 9·27 p.c. of stems	The Manitou Farmers' Store Co., Manitou, Man.

APPENDIX B.—INSPECTION OF CLOVES

Date of Collection.	Description of Sample, Name and Address of Manufacturer or Furnisher, as given by Vendor.	No. of Analyst's Certificate.	No. of Sample.	Result of Analysis.			
				Moisture.	Oil.		
					Volatile.	Non-volatile. Pet. : Ether Extract.	Fixed.
1899.	*Official Analyst, Dr. C. J. Fagan, Victoria, B.C.*			p. c.	p. c.	p. c.	p. c.
Sept. 12	Ground ; Todhunter & Mitchell, Toronto	15049	20141	5·60	4·04	....	9·26
" 12	"	15050	20142	6·20	10·05	.....	7·62
" 12	" Snowdrift Co., Brantford, Ont	15051	20145	8·10	2·90	...	11·82
" 12	Whole	15052	20148	6·30	12·78	....	10·23
" 12	Ground	15053	20150	7·10	9·24	.....	9·08
" 12	Whole	15054	20151	8·42	11·16	.....	9·16
" 12	.....	15055	20154	8·36	13·00	....	9·12
" 12	"	15056	20155	8·49	6·93	.....	8·07

(Whole and Ground)—Tabulated Statement—*Concluded.*

Fat.	Ash.	Remarks by Analyst.	Name and Address of Vendor of Sample.
p. c.	p. c.		
.....	6·04	Many starch granules; poor quality	Weeks & Robson, Vancouver, B.C.
...	5·87	Very few starch granules; genuine	S. Cobb "
.....	7·37	Contains many stems and some starch granules; adulterated with stems and poor in quality.	Mrs. Stofford "
....	6·91	Genuine	Geo. Hobson "
.....	5·03	" a few starch granules	T. S. Annandale, New Westminster, B.C.
....	5·51	"	Geo. Adams " "
.....	5·99	"	T. S. Annandale " "
.....	4·96	Poor in quality	E. J. Rae " "

APPENDIX C.—INSPECTION OF SCOTCH

Date of Collection.	Description of Sample, Name and Address of Manufacturer or Furnisher, as given by Vendor.	No. of Analyst's Certificate.	No. of Sample.	Result of					
				Specific Gravity		Difference.	Fixed Matter, Grains per litre.	Alcohol.	
				Of Sample.	Of Distillate			By Weight.	By Volume.
1899.	*Official Analyst, Dr. F. X. Valade, Ottawa.*							p. c.	p. c.
Aug. 29	Scotch whisky (Pure Malt), McLaren, Perth, Ont.	14620	18451	0·9299	0·9278	0·0021	9·424	45·64	53·52
" 29	Scotch whisky (Fine Old) Meagher, Bros. & Co., Montreal.	14621	18452	0·9554	0·9532	0·0022	0·305	32·78	39·36
" 29	Scotch whisky, Jno. Hope, agent, Montreal.	14622	18453	0·9335	0·9320	0·0015	3·387	43·71	51·34
" 29	Scotch whisky...	14623	18454	0·9415	0·9403	0·0012	4·35	39·65	46·96
" 29	Scotch whisky (Old Scotch), McMeen & Co., Glasgow, Scotland.	14624	18455	0·9468	0·9447	0·0021	1·28	37·28	44·36
" 31	Scotch whisky (Fine), McAlpine & Co., Glasgow, Scotland.	14625	18456	0·9445	0·9442	0·0023	1·14	38·67	45·89
" 31	Scotch whisky (Heather), Mitchell Bros., Glasgow, Scotland.	14626	18457	0·9361	0·9345	0·0016	1·74	42 52	50·06
" 31	Scotch whisky, Thom & Cameron, Glasgow, Scotland.	14627	18458	0·9323	0·9301	0·0022	0·772	45·59	52·26
" 31	Scotch whisky, Spalding & Stewart, Perth, Ont.	13628	18459	0·9313	0·9305	0·0008	0·949	44·44	52·08
	Official Analyst, F. T. Harrison, London, Ont.								
22	Scotch whisky, H. Corby, Belleville, Ont.	14119	19277	0·9094	0·9087	0·0007	0·940	54·10	61·98
" 22	Scotch whisky (Glenlivet), Andrew Usher & Co,, Edinburgh, Scot.	14120	19278	0 9361	0·9358	0·0003	1·070	41·88	49·40
" 22	Scotch whisky, Bullock, Laird & Co.	14121	19279	0·9333	0·9330	0·0003	1·250	43·22	50·82
" 23	Scotch whisky (Islay), J. & R. Harvey, Glasgow, Scotland.	14122	19280	0·9175	0·9160	0·0015	1·270	50·87	58·80
" 23	Scotch whisky (Mountain Dew), Spalding & Stewart, Perth, Ont.	14123	19281	0·9366	0·9361	0·0005	0·740	41·72	49·24
" 23	Scotch whisky, A. Stewart & Co., Glasgow, Scotland.	14124	19282	0·9346	0·9336	0·0013	0·250	42·95	50·54
" 23	Scotch whisky.....	14125	19283	0·9393	0·9381	0·0012	0·876	40·71	48·16
" 23	Scotch whisky (Bonnie Doon) Hay, Fairman & Co., Glasgow, Scot.	14126	19284	0·9362	0·9355	0·0007	0·618	42·02	49·56
" 23	Scotch whisky (Four Stars) Donald & Co., Glasgow.	14127	19285	0·9419	0·9407	0·0012	0·600	39·39	46·75
	Official Analyst, Dr. W. H. Ellis, Toronto.								
" 28	Scotch whisky (Loch Carron) Graham, Davy & Co., Argyleshire, S.	12370	19286	0·9555	0·9541	0·596	....	32·21	38·68
" 28	Scotch whisky (Colonsay), J. Turner & Co., Hamilton, Ont.	12371	19287	0·9180	0·9177	0·916	..	50·06	57·88
" 28	Scotch whisky (Mountain Dew), Spalding & Stewart, Perth, Ont.	12372	19288	0·9301	0·9290	0·249	...	45·07	52·72
" 28	Scotch whisky (Old Islay), Geo. Barnhardt, Galt, Ont.	12373	19289	0·9354	0·9341	0·450	.... .	42·72	50·26
28	Scotch whisky (The Clansman), J. Taylor & Co., Glasgow, Scotland.	12374	19290	0·9433	0·9432	0·624	.... .	38 10	45·28
" 28	Scotch whisky, Howard & Sons, Toronto.	12375	19291	0·9521	0·9503	6·180	.	34·36	41·16
" 28	Scotch whisky (Bonnie Doon), Hay, Fairman & Co., Glasgow, Scot.	12376	19292	0 9366	0·9366	0·644	....	41·49	48·97
" 38	Scotch whisky (Benmore), McRae, Ross & Co., Glasgow.	12377	19293	0·9430	0·9424	1·076	.. .	38·58	45·77
" 28	Scotch whisky, (Extra Special), J. Dewar & Son, Perth, Scotland.	12378	19294	0·9388	0·9378	0·912	.. . .	40·89	48·32
" 28	Scotch whisky (Clenaskit)	12379	19295	0·9396	0·9406	1·164	....	39·50	46 80

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WHISKEY—Tabulated Statement.

Analysis.				Remarks by Analyst.	Name and Address of Vendor of Sample.
Proof Spirit.	Opalescence on Diluting 1 to 2	Furfurol.	Acetone		
p. c.					
93·48	Distinct ...	Distinct	None...	Genuine	Kennedy & Co., Ottawa.
68·98	None.	" ...	" ...	Probably an imitation article.	" "
89·95	Slight	Faint..	" ...	" " ..	G. Lebel "
82·31	"	"	" ...	" " ..	T. Martin "
77·75	None.....	"	" ...	" " ..	A. Beaudet "
80·43	"	"	" ...	" " ..	S. Lochnan, Aylmer, Que.
87·73	Slight	"	" ...	" " ..	D. A. Decosse & Cie, Hull, Que.
91·56	"	"	" ...	" " ..	Cameron & McDonald, Cornwall.
91·27	Distinct.....	Distinct ..	" ...	Genuine	John Duffy, Cornwall.
108·62	Distinct	Very distinct..	None...	Contains no added injurious substance.	E. Dawson, Seaforth, Ont.
86·56	Slight	Distinct	" ...	" " ..	W. W. Saults, Goderich, Ont.
89·06	"	" .. .	" ...	" " ..	Geo. Broxton "
103·05	Distinct.....	Very distinct..	" ...	" " ..	Thos. Quirk, Stratford, Ont.
86·29	"	Distinct .. .	" ...	" " ..	Walsh Bros. "
88·56	"	"	" ...	" " ..	A. Beattie & Co., St. Mary's, Ont.
84·39	Fairly distinct	"	" ...	" " ..	Whelian Bros. "
86·85	None or very slight trace.	Faint.... ...	" ...	" " ..	John Gavey, Dundas, Ont.
81·93	None..... ...	Very faint....	.....	Probably largely patent still spirit. Contains no added injurious substance.	Jas. Wilson, London, Ont.
67·80	Clear.....	Faint.....	None...	Unadulterated	A. McIntyre, Woodstock, Ont.
101·43	Faint.....	"	" ..	. .....	J. D. McKenzie "
92·40	Distinct	"	" ...	"	J. H. Ahrens, Paris, Ont.
88·09	Clear.....	"	" ...	"	J. Ealand "
79·36	"	"	" ...	"	P. & R. Laing, Dundas, Ont.
72·13	"	"	" ...	"	H. C. Gifford, Brampton, Ont.
85·81	"	"	" ...	"	T. K. Haffey, Toronto.
80·21	"	"	" ...	"	C. J. Kidd "
84·68	Slight.....	"	" ...	"	M. Lawyer "
82·02	Faint.....	.....	" ...	"	J. D. Lea & Co. "

APPENDIX D.—INSPECTION OF PEPPER

Date of Collection.	Description of Sample, Name and Address of Manufacturer or Furnisher, as given by Vendor.	No. of Analyst's Certificate.	No. of Sample.	Result of			
				Moisture.	Loss by Extraction with Alcohol of 0·815 Sp. Gr.	Extract by Evaporation.	Volatile Matter in Extract.
1899.	*Official Analyst, M. Bowman, Halifax, N.S.*			p. c.	p. c.	p. c.	p. c.
Nov. 10	White; Simpson Bros., Halifax, N.S.	12755	16744	10·45			
" 10	Black; J. P. Mott & Co., Halifax, N.S.	12756	16745	9·39		13·71	
" 14	" W. H. Schwartz & Sons, Halifax, N.S.	12757	16746	9·13		13·95	
" 14	White; J. P. Mott & Co., Halifax, N.S.	12758	16747	10·55		9·24	
" 14	" W. H. Schwartz & Sons, Halifax, N.S	12759	16748	10·50		9·40	
" 6	" C. & E. McMichael, St. John, N.B.	12750	17684	10·19		8·91	
" 6	" imported by vendors	12751	17685	9·93		9 08	
" 6	Black; T. B. Barker & Sons, St. John, N.B.	12752	17686	8·88		7·72	
" 6	" W. G. Dunn & Co., Hamilton, Ont.	12753	17687	9·11		13·09	
" 7	" Dearborn & Co., St. John, N.B.	12754	17688	9·15		14·52	
	Official Analyst, Dr. M. Fiset, Quebec.						
Nov. 8	White; S. H. Ewing & Sons, Montreal	10190	19629	11·30	8·05	8·25	
" 8	Black	10191	19630	12·20	12·15	12·20	
" 8	White; Langlois & Paradis, Quebec	10192	19631	12·10	9·20	9·25	
" 8	Black "	10193	19632	11·18	11·25	11·20	
" 8	"	10194	19633	10·77	7·60	7·70	
" 8	White	10195	19634	10·85	4·80	4·87	
" 22	" Pure Gold Manufacturing Co., Toronto.	10196	19635	11·73	9·10	9·20	
" 22	Black	10197	19636	10·38	13·77	13·60	
" 22	"	10198	19638	9·45	13·55	11·55	2·00
" 22	White	10199	19638	12·05	9·27	8 55	0·72
	Official Analyst, Dr. J. B. Edwards, Montreal.						
Oct. 27	White; Marrotte & Leblanc, Montreal	15655	19607	13·98	8·82	8·02	0·80
" 27	Black " "	15656	19608	14·13	10·64	10·60	0·04
" 30	White " "	15657	19609	14·21	8·58	8·28	0·30
" 30	" R. Herron & Co.	15658	19610	14·92	3·86	3·75	0·11
" 30	Black "	15659	19611	11·09	12·89	8·07	4·82
" 31	White	15660	19612	11·53	7·97	6·42	1·55
" 31	Black	15661	19613	10·69	12·67	9·98	2·69
" 31	" Laporte, Martin & Co	15662	19614	13·06	9·87	8·80	1·07
Nov. 2	White; S. J. Major, Ottawa	15663	19615	14·38	7·29	7·05	0·24
" 2	Black	15664	19616	8.57	16·94	12·52	4·42
" 2	White	15665	19617	13·96	6·53	6·25	0·28
	Official Analyst, Dr. F. X. Valade, Ottawa.						
Oct. 31	White	14638	18480	11·03	21·18	9·91	
" 31	" Bate & Co., Ottawa.	14639	18481	11·96	18·55	7·40	
" 31	"	14640	18482	9·17	18·78	7·54	
" 31	" Pure Gold Manufacturing Co., Toronto	14641	18483	11·53	19·12	8·54	
" 31	"	14642	18484	11·73	27·35	7·24	
" 31	Black; Pure Gold Manufacturing Co.	14643	18485	10·21	21·65	11·35	

SESSIONAL PAPER No. 14

(Black and White)—Tabulated Statement.

Analysis.					
Ash.				Remarks by Analyst.	Name and Address of Vendor of Sample.
Total.	Soluble in Water.	Insoluble in Water.	Insoluble in Acid.		
p. c.	p. c.	p. c.	p. c.		
4·58	0·18	4·40	0·45	Genuine	Wood & Murphy, Windsor, N.S.
5·11	2·49	2·62	0·51	"	Shand Bros. "
6·80	2·88	3·92	0·89	"	N. Cornfoot, Halifax, N.S.
3·55	0·29	3·26	0·33	"	W. C. Anderson "
4·17	0·37	3·80	0·22	"	J. A. Leaman & Co. "
3·33	0·32	3·01	0·38	"	J. F. Vanwart, St. John, N.B.
3·44	0·27	3·17	0·63	"	Puddington & Merritt "
12·90	2·45	10·45	6·65	Adulterated with wheat starch and contains also a large amount of sand.	M. J. Rankine "
5·45	2·33	3·12	0·85	Genuine	G. M. & A. A. Barker "
5·34	3·17	2·17	0·24	"	R. McConnell "
2·96	0·70	2·26	0·36	Genuine	Duplain & Pagnet, Quebec.
5·56	2·00	3·56	1·04	"	" "
2·58	0·60	1·98	0·32	"	G. Turcotte "
3·76	2·08	1·68	0·20	"	" "
4·82	1·44	3·38	1·26	Rice starch and cayenne present, also some unidentified tissue ; adulterated.	M. Blouin & Co. "
2·08	0·82	1·26	0·14	Wheat and rice starches, cayenne, fibrous tissues present ; adulterated.	" "
1·04	0·26	0·78	0·18	Genuine	S. Bechand & Son, Coaticook, Que.
7·36	2·42	4·94	0·74	Cocoanut shell present ; adulterated	" "
5·06	2·32	2·74	0·88	" "	J. P. Durand "
3·08	0·68	2·40	0·34	Genuine	" "
2·33	1·33	1·00	0·14	Genuine	J. B. Vanier, Montreal.
6·03	3·40	2·63	0·51	Contains roasted peas and maize and millings ; adulterated to the extent of 10 to 15 p. c.	P. Dufour "
2·51	1·14	1·37	0·32	Genuine	G. Brenner "
2·26	0·77	1·49	0·17	Contains wheat flour, maize, pea flour, mustard husks and turmeric ; adulterated to the extent of from 30 to 40 p. c.	J. Lauder "
16·13	6·06	10·17	4·92	" "	" "
2·31	0·60	1·71	0·27	Genuine	Leduc et Frère, Valleyfield, Que.
5·99	3·54	2·45	0·56	Contains mustard husk, capsicum and maize starch ; adulterated from 5 to 10 p. c.	" "
7·27	1·89	5·38	2·00	Contains wheat flour and maize, cayenne, and mustard husks and millings ; adulterated to the extent of 30 to 40 p. c.	L. A. Trempe "
6·88	0·44	6·44	0·26	Genuine	P. Daoust, Hull, Que.
6·52	2·24	4·28	0·80	"	" "
6·40	3·63	2·77	0·38	Contains pea flour, maize and millings ; adulterated to the extent of 5 to 10 p. c.	A. Gagnon "
2·46	1·40	1·06	0 02	Genuine	Morrison & Morrison, Ottawa.
3·50	0 29	3·21	0·40	"	Wall & Co. "
4·08	0·91	3·17	0·78	From 2 to 5 p. c. wheat starch ; and olive shells ; adulterated.	Miles Slattery "
1·70	0·16	1·54	0·20	Genuine	A. E. Cowan "
3·33	0·26	3·07	0·34	About 5 p. c. olive stone ; adulterated	A. C. Goulet, Rochesterville, Ont.
4·22	1·71	2·51	1·26	Genuine	A. E. Cowan, Ottawa.

APPENDIX D.—INSPECTION OF PEPPER

Date of Collection.	Description of Sample, Name and Address of Manufacturer or Furnisher, as given by Vendor.	No. of Analyst's Certificate.	No. of Sample.	Result of			
				Moisture.	Loss by Extraction with Alcohol of 0·8E Sp. Gr.	Extract by Evaporation.	Volatile Matter in Extract.
1899.	*Official Analyst, Dr. F. X. Valade, Ottawa*—Con.			p. c.	p. c.	p. c.	p. c.
Oct. 31	Black ; S. J. Major	14644	18486	11·10	21·68	7·43	.....
" 31	" Hamilton Coffee and Spice Co.	14645	18487	10·96	22·47	10·44	.
" 31	" Bate & Sons, Ottawa	14646	18488	9·87	19·78	9·47	... .
	Official Analyst, Dr. W. H. Ellis, Toronto.						
Nov. 10	White (compound)	12390	18360	11·01	6·33	7·01	....
" 10	— Pure Gold Mfg. Co., Toronto	12391	18361	11·16	7·31	8·50	....
" 11	" Todhunter & Mitchell, Toronto	12392	18362	12·08	7·69	8·35	.....
" 11	" " " "	12393	18363	10·33	7·63	9·25	....
" 11	"	12394	18364	9·35	9·70	12·73	.....
" 10	Black ; Pure Gold Mfg. Co	12395	18365	9·85	13·12	15·55	.....
" 10	" Todhunter & Mitchell	12396	18366	10·49	9·00	10·50	.....
" 10	" Hamilton Spice Co	12397	18367	9·35	10·28	11·60	.....
" 10	" Todhunter & Mitchell	12398	18368	9·20	7·76	9·70	.....
" 10	" (compound)	12399	18369	9·83	8·50	8·70	..
	Official Analyst, W. H. Harrison, London, Ont.						
Oct. 14	White; J. Turner & Co., Hamilton	14139	19305	9·30	..	..	..
" 14	" Todhunter & Mitchell	14140	19306	10·00	...	...	.....
" 16	— Macpherson, Glassco & Co., Hamilton	14141	19307	9·75	..	..	....
" 16	Hamilton Coffee and Spice Company	14142	19308	9·65	.....	.....	.....
" 17	Snow Drift Baking Powder Co., Brantford, Ont.	14143	19310	10·30	...	.....	.....
" 17	" Hamilton Coffee and Spice Company	14144	19311	10·65	..	..	..
" 18	" J. M. Mayell & Co., London, Ont.	14145	19312	9·65	.....	.....	.....
" 18	— Gorman & Eckhart, London, Ont.	14146	19313	7·85	Principally, gypsum		
" 18	— — — —	14147	19314	8·25			
	Official Analyst, Prof. E. B. Kenrick, Winnipeg.						
Nov. 20	White; Todhunter & Mitchell, Toronto	11337	17203	11·22	6·42	.....	None.
" 20	Black; H. A. O. Ewing, Montreal	11338	17204	11·20	8·77	.....	"
" 20	White; Todhunter & Mitchell, Toronto	11339	17205	11·85	6·75	.....	"
" 22	Black; Dyson, Gibson & Co., Winnipeg	11340	17206	8·63	10·12	....	"
" 22	White; G. F. & J. Galt, Winnipeg	11341	17217	10·87	5·20	.....	"
" 22	Black; Balfour & Co., Hamilton	11342	17218	11·83	9·10	.....	"
" 23	" Lucas, Steele & Bristol, Hamilton	11343	17219	10·03	7·78	.....	"
" 23	White; Todhunter & Mitchell, Toronto	11344	17220	12·24	6·65	.....	"
" 23	" W. G. Dunn, Hamilton	11345	17221	11·46	5·44	.....	...
" 23	Black; Hamilton Coffee and Spice Company	11346	17222	11·12	10·43	..	....
	Official Analyst, Dr. C. J. Fagan, Victoria, B.C.						
" 23	White; Pure Gold Mfg. Co., Toronto	15057	20157	13·91	20·59	10·47	10·12
23	"	15058	20158	13·57	14·95	6·33	8·62
23	"	15059	20159	14·72	19·82	8·77	11·05
" 23	Black	15060	20160	11·70	23·14	15·56	7·45
" 23	" B. C. Canning Co., Vancouver	15061	20161	13·40	18·98	9·38	9·60
" 24	"	15062	20165	13·52	22·51	11·41	11·10
24	White	15063	20166	14·16	21·27	9·71	11·56
" 24	Black; Todhunter, Mitchell & Co., Toronto	15064	20167	42·70	19·67	9·93	9·74

(Black and White)—Tabulated Statement.

Analysis.				Remarks by Analyst.	Name and Address of Vendor of Sample.
Ash.					
Total.	Soluble in Water.	Insoluble in Water.	Insoluble in Acid.		
p. c.	p. c.	p. c.	p. c.		
9·41	1·95	7·46	3·82	Wheat, corn and bean starches, and olive stone cells; adulterated.	A. Barbe, Rochesterville, Ont.
4·36	2·37	1·99	0·12	Genuine	S. Stitt "
4·55	1·23	3·32	0·80	Rice in large quantity, olive stone cells; potato and corn starches; adulterated.	J. Evans "
1·65	0·35	1·30	0·15	A mixture of white pepper and farinaceous matter.	W. H. Wrighton, Peterboro', Ont.
3·05	0·80	2·25	0·30	Genuine	E. Brown & Co. "
2·05	0·60	1·50	0·30	"	J. O. Carpenter, Hamilton, Ont.
2·35	0·35	2·00	0·35	"	H. Lindsay, Toronto.
3·85	0·95	2·90	6·30	"	W. Laing "
4·90	1·60	3·30	0·80	"	E. Brown & Co., Peterboro', Ont.
5·15	1·25	3·90	1·15	"	J. O. Carpenter, Hamilton, Ont.
4·20	1·80	2·40	0·55	"	J. J. McQuarrie "
5·25	1·55	3·70	0·95	"	H. Lindsay, Toronto, Ont.
7·70	1·45	6·25	2·15	Various vegetable matters other than pepper.	W. Laing "
1·35	0·15	1·20	0·20	Genuine	Peter Dill, Seaforth, Ont.
2·47	0·35	2·12	0·25	"	Andrew Young "
1·50	0·30	1·20	0·15	Adulterated by addition of rice flour	F. Davis, Mitchell, Ont.
1·57	0·22	1·35	0·35	Genuine	W. J. Levy "
1·97	0·47	1·50	0·20	Adulterated by addition of wheat flour	John Walker, Paris, Ont.
4·75	2·30	2·45	0·42	Shows a little wheat starch; slightly adulterated.	D. Shephard "
4·50	1·15	3·35	0·45	Genuine	R. H. Cullis, London, Ont.
16·35	14·65	1·70	0·17	Adulterated with gypsum and flour and ground biscuit.	F. Harding "
16·03	14·45	1·58	0·17	" "	F. H. Robinson "
1·27	0·26	1·01	0·12	Genuine	A. F. Calder, Winnipeg.
4·90	1·71	3·19	1·24	"	J. L. Wells & Co. "
2·17	0·27	1·90	0·33	"	W. L. Capell "
6·68	1·85	4·83	1·56	"	J. Liven "
2·43	0·31	2·12	0·19	"	W. M. Crawford, Indian Head, Man.
4·40	2·27	2·13	0·45	"	E. J. Brooks & Co. "
8·75	1·82	6·93	2·97	Adulterated with wheat starch	R. H. Benson & Co. "
2·12	0.24	1·88	0·31	Genuine	W. J. Young, Brandon, Man.
2·71	0·32	2·39	0·23	"	Smith & Burton "
4·68	2·25	2·43	0·58	"	J. Symington "
3·76	0·58	3·18	0·64	Genuine	J. F. May, Vancouver, B.C.
1·84	0·58	1·26	0·43	"	B. B. Brown "
1·54	0·84	0·70	0·28	"	C. Mowatt "
8·22	6·37	1·85	0·36	"	M. MacTaggart "
6·19	2·11	4·08	1·30	Adulterated with starch	Mrs. K. Fleming "
5·04	3·77	1·27	0·20	Genuine	C. McDonough, N. Westmin'r, B.C.
1·14	0·19	0·95	0·21	"	McKenzie & Bros. "
6·38	4·11	5·72	0·66	"	Parnett & Grumm "

APPENDIX E.—INSPECTION OF CANADIAN

Date of Collection.	Description of Sample. Name and Address of Manufacturer or Furnisher, as given by Vendor.	No. of Analyst's Certificate.	No. of Sample.	Result of Specific Gravity. Of the Wine.	Dealcoholized Wine.	Alcohol in 100cc. By Wt.	By Vol.	Proof Spirit.	Total Solids in 100 cc.	Reducing Sugar as Dextrose.
1899.	*Official Analyst, M. Bowman, Halifax, N.S.* BRAND.					p. c.	p. c.	p. c.	p. c.	p. c.
Nov. 8	"St. Augustine," Pelee Island Wine Company.	12762	17689	1·0436	1·0602	9·38	12·34	21·62	13·34	11·95
" 8	"S. Port," St. David's Vine Growers Co., Toronto.	12763	17690	1·0432	1·0576	9·57	12·58	22·06	14·06	12·17
" 8	"Special Old Sherry," Ontario Wine Mfg. Co., St. Catharines, Ont.	12764	17691	1·0110	1·0298	12·16	15·49	27·65	6·59	4·62
" 14	"Golden Diana" " " ..	12765	17692	1·0508	1·0672	10·42	13·81	24·19	15·87	13·28
" 17	"Niagara Sweet Catawba," T. G. Bright & Co., Toronto.	12766	17693	1·0387	1·0520	10·30	13·56	23·78	12·60	11·70
" 9	"Imperial," St. David's Vine Growers' Co., Toronto.	12767	16749	1·0366	1·0515	10·07	13·15	23·04	11·32	11·04
" 13	"Port" " " ..	12768	16750	1·0189	1·0380	11·99	15·40	26·99	8·06	6·53
" 13	"Catawba," T. G. Bright & Co.. Toronto.	12769	16751	1·0179	1·0362	12·44	15·96	27·97	8 25	7·51
" 13	"Catawba," Pelee Isl'd Wine Co.	12770	16752	1·0498	1·0627	8·91	11·79	20·65	14·72	14·20
" 13	"Double Diamond Port," St. David's Vine Growers' Co.	12771	16753	1·0426	1·0606	9·65	12·08	22·22	13·37	12·33
	Official Analyst, Dr. M. Fiset, Quebec.									
" 8	Ontario Grape Growing Co. of St. Catharines, Ont.	13601	19639	1·05581	1·07159	10·81	13·39	23·45	16.29	16·71
" 8	G. Bright & Co., Niagara Falls.	13602	19640	1·03386	1·05121	11·37	14·08	24·67	11·02	11·68
" 8	"Golden Diana," Ontario Wine Mfg. Co., St. Catharines.	13603	19641	1·05924	1·07610	11·23	13·90	24·36	17·20	17·10
" 8	Ontario Wine Mfg. Co., St. Catharines.	13604	19642	1·02942	1·04783	12·05	14·88	26·09	10 83	10·69
" 8	St. David's Wine Co..	13605	19643	1·03647	1·05337	10·89	13·48	23·62	12·04	12·00
" 22	Vendor...	13606	19644	1·01957	1·03388	8·95	11·10	19·45	7·26	6·90
" 22	. . . . .	13607	19645	1·04548	1·06157	10·82	13·39	23·47	13·90	14·04
" 22	. . . . .	13608	19646	1·03628	1·05301	10·08	12·49	21·89	11·80	12·24
" 22	Canada Liquor Co., Montreal.	13609	19647	1·03925	1·05592	10·17	12·60	22·10	11·88	12·00
" 22	" " ..	13610	19648	1·00825	1·02647	11·89	14·70	25·75	5·68	4·34
	Official Analyst, Dr. J. B. Edwards, Montreal.									
Oct. 28	St. David's Wine Co., Toronto	15666	19618	1·0357	1·0488	10·46	12·96	22·47	12·87	7·47
" 30	Ontario Grape Growing and Wine Co.	15668	19619	1·0388	1·0530	10·85	13·43	23·47	13·70	9·91
" 30	. . . . .	15669	19620	1·0453	1·0587	10·85	13·43	23·47	14·74	10·58
Nov. 2	St. David's Wine Co.....	15670	19621	1.0327	1·0500	12·38	15·30	26·82	12·77	10·10
" 2	" "	15671	19622	1·0280	1·0306	11.38	14·09	24·68	14·10	8·98
" 9	. . . . .	15672	19623	1·0420	1·0567	11·15	13·81	24·20	17·92	11·19
" 9	Niagara Falls Wine Co....	15673	19624	1·0068	1·0246	11.62	14·37	25·17	7·10	3·87

SESSIONAL PAPER No. 14

NATIVE WINES—Tabulated Statement.

Analysis.							
Polarisation.	Acidity in 100 cc. Total as Tart. Acid.	Fixed as Tart. Acid.	Volatile as Acetic Acid.	Ash.	Colour and Clearness.	Remarks by Analyst.	Name and Address of Vendor of Sample.
	p. c.	p. c.	p. c.	p. c.			
— 15·40	0·736	0·414	0·257	.. ..	Red, clear....	Not genuine, foreign sugar having been added	E. G. Scovil, St. John, N.B.
— 4·11	0·651	0·411	0·192	...	"	" " ..	R. Sullivan & Co. "
— 8·55	0·658	0·496	0·130	....	Sherry colour, clear.	Alcohol having been added.	McIntyre & Comeau "
— 37·2	0·985	0·697	0·230	.	" ..	Foreign sugar added...	Norman McDonald, Fredericton, N.B.
— 29·41	0·573	0·387	0·149	.....	Slightly pink, clear.	" ...	T. H. Haley, St. John, N.B.
— 32·34	0·713	0·403	0·248	...	Sherry colour, muddy.	" ...	W. Poole, Windsor, N.S.
— 18·90	0·984	0·604	0·304	.	Red, clear....	Alcohol added..... ..	Kelley & Glassey, Halifax.
— 22·00	0·612	0·395	0·173	.....	Sherry, clear..	"	" "
— 19·38	0·844	0·457	0·309	....	" ..	Foreign sugar added...	J. Scott & Co. "
— 3·08	0·589	0·372	0·173	....	Red, clear ...	" ...	T. F. Courtney & Co. "
... .	0·694	0·451	0·197	0·208	Dk. claret, clear.	Foreign sugar used....	H. A. Pare, Quebec.
.....	0·750	0·577	0·143	0·184	" .	"	P. L. Turgeon "
.....	0·817	0·542	0·215	0·144	Golden red, pretty clear.	"	A. Grenier "
.....	0.781	0·456	0·255	0·172	Dk claret, clear.	Foreign sugar used and perhaps alcohol.	" "
....	0·657	0·340	0·251	0·164	" ..	Foreign sugar used....	Dion & Frère "
.....	0·449	0·272	0·137	0·080	Magenta, not very clear.	Effervescence on opening bottle; ash too low; foreign sugar used, and perhaps water added.	V. Paradis, Coaticook, Q.
.....	0·638	0·460	0·221	0·192	Dk claret, clear.	Foreign sugar used ...	P. Oliver, Sherbrooke, Q.
.....	0·706	0·329	0·307	0·192	Dk cherry, cl'r.	"	L. H. Guay "
....	0·741	0·360	0·304	0·188	" ..	"	E. M. Blanchard "
.....	0·843	0·394	0·358	0·208	" ..	Foreign sugar probably used.	F. R. Darche "
.....	0·611	0·563	0·038	0·13	Ruby, clear...	Adulterated by the addition of cane sugar.	J. Laurin, Montreal.
.....	0·740	0·631	0·087	0·22	Purple to brown, clear.	" " ..	G. Brenner "
.... ..	0·869	0·815	0·038	0·25	Brownish purple, turbid.	" " ..	O. Voisard "
.....	0·610	0·584	0·021	0·26	Ruby, vy. clear	" " ..	M. J. Laverdure, Hull, Q.
.....	0·618	0·462	0·125	0·17	Tawny, clear..	" " ..	" "
.....	0·769	0·645	0·108	0·23	" .	" " ..	N. Dufresne, Three Rivers, Q.
... ...	0·924	0·835	0.071	0·27	" .	Alcohol added; no foreign sugar; adulteration doubtful.	Rivard & Frères "

APPENDIX E.—INSPECTION OF CANADIAN

Date of Collection.	Description of Sample, Name and Address of Manufacturer or Furnisher, as given by Vendor.	No. of Analyst's Certificate.	No. of Sample.	Result of Specific Gravity Of the Wine.	Specific Gravity Dealcoholised Wine.	Alcohol in 100cc. By Wt.	Alcohol in 100cc. By Vol.	Alcohol in 100cc. Of proof spirit.	Total Solids in 100 cc.	Reducing Sugar as Dextrose.
1899.	*Official Analyst, Dr. J. B. Edwards, Montreal*—Con. BRAND.					p. c.	p. c.	p. c.	p. c.	p. c.
Sept. 9	J. W. Lee & Co., Toronto ...	15674	19625	1·0339	1·0480	10·54	13·05	22·67	15·88	9·57
" 16	"St. Bernard," Trappists' Monastery, Oka, P.Q.	15675	19626	1·0189	1·0350	12·38	15·30	26·82	10·94	6·90
" 16	"St. Anne" " " ..	15676	19627	1·0216	1·0372	11 62	14·37	25·17	11·23	7·26
" 16	"Lorrette" " "	15677	19628	1·0159	1·0324	12·31	15·21	26·16	10·30	6·68
	Official Analyst, Dr. F. X. Valade, Ottawa.									
Oct. 30	"Port," not known.	14647	18489	1·0235	1·0367	15·75	19·39	33·96	9·07	8·07
" 30	"Red" "	14648	18490	1·0408	1·0538	12·69	15·68	27·48	7·51	5·79
" 30	"Concord," Pelee Isl'd Wine Co	14649	18491	1·0467	1·0565	11·08	13·71	24·03	13·64	12·61
" 30	"St. Augustine" " " ..	14650	18492	1·0430	1·0618	11·69	14·46	25·34	12·68	11·60
" 31	"Catawba," St. David's W. Co	14651	18493	1·0220	1·0341	9·21	11·44	20·04	8·02	6·05
" 31	"Pure," Stamford Park W. Co	14652	18494	1·0335	1·0524	11·62	14·37	25·18	11·65	10·09
" 31	"4-yrs-old," Pelee Isl'd W. Co.	14653	18495	1·0394	1·0552	10·69	13·24	23·21	7·89	7·07
" 31	St. David's Wine Co.....	14654	18496	1·0324	1·0496	12·77	15·77	27·64	11·05	9·08
" 31	T. E. Bright & Co., Toronto..	14655	18497	1·0049	1·0260	14·45	17·81	31·22	5·88	4·69
	Official Analyst, Dr. W. H. Ellis, Toronto									
Nov. 10	"Sweet Catawba," Pelee Island Wine Co.	12401	18370	1·0347	1·0481	7·93	9·86	17·29	11·28	10·90
" 10	"St. David's Port," Lee & Co., St. Catharines.	12402	18371	1·0358	1·0509	9·23	11·44	20·44	12·46	9·84
" 10	"Catawba," Pelee Island Wine Co.	12403	18372	1·0239	1·0426	10·46	12·96	22·71	9·98	9.31
" 11	"Dry Catawba," The Hoskins Wine Co., Hamilton.	12404	18373	0·9897	1·0070	11·15	13·81	24·19	1·46	0·56
" 11	"Port," The Hoskins Wine Co., Hamilton.	12405	18374	1·0134	1·0348	13·62	16·80	29·43	7·68	7 26
" 11	"Sweet Catawba," Pelee Island Wine Co.	12406	18375	1·0400	1·0547	8·50	10·56	18·50	12·90	13·51
" 11	"Salem" Grimsby Wine Co..	12407	18376	1·0428	1·0610	11·23	13·90	24·36	14·20	13·95
" 11	"Port," St. Catharines Wine Co.	12408	18377	1·0416	1·0592	10·85	13·43	23·54	14·06	13·63
" 11	"Concord"	12409	18378	1·0289	1·0472	11·62	14 37	25 18	11·24	10·26
" 11	The Niagara Falls Wine Co..	12410	18379	1·0370	1·0556	11·38	14·09	24 69	13.06	12·18
	Official Analyst, F. T. Harrison, London, Ont.									
" 2	The Hoskins Wine Co., Hamilton.	14148	19315	1·0495	1·0640	9·33	11·75	20.57	15·49	12·01
" 2	Pelee Island Wine Co..	14149	19316	1·0477	1·0614	9·46	11·91	20·88	15·02	12·33
" 2	Ontario Grape Wine Co., St. Catharines.	14150	19317	1·0339	1·0507	11·60	14·60	25·59	12·38	9·89
" 2	T. E. Bright & Co..... .	14151	19318	1·0350	1·0518	11·04	13·90	24·36	12·50	10·79
" 3	E. Girardot & Co., Sandwich, Ont.	14152	19319	1·0112	1·0300	12·34	15·53	27 23	7·01	5·26
" 3	John Finlay, Pelee Island....	14153	19320	1·0290	1·0443	9·95	12 54	21.98	10·85	9·11

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NATIVE WINES—Tabulated Statement—*Continued.*

Analysis.							
Polarisation.	Acidity in 100cc. Total as Tart. Acid.	Fixed as Tart. Acid.	Volatile as Acetic Acid.	Ash.	Colour and Clearness.	Remarks by Analyst.	Name and Address of Vendor of Sample.
	p. c.	p. c.	p. c.	p. c.			
.. ....	0·665	0·584	0·065	0·23	Ruby, vy. clear	Adulterated as containing cane sugar.	B. B. Brunelle, Three Rivers.
... .	0·604	0·543	0·049	0·54	Ruby, clear..	" " ..	Guay & Ostigny, Montreal.
... .	0·930	0·808	0·081	0·23	" ..	" " ..	" "
. . ....	0·571	0·509	0·049	0·23	Tawny, clear..	" " ..	" "
— 8·5	1·03	0 834	0·49	0·15	Red, bright...	Alcohol added; adult'd.	Bate & Co., Rideau st., Ottawa
— 11·5	1·36	1·14	0·36	0·15	Red, cloudy ..	" " .	" " "
— 16·1	1·57	0·93	0 07	0·14	Red, bright...	Foreign sugar added...	Godfroid Lebel " "
– 16·5	1·49	1·31	0·06	0·12	" ...	" " ..	" " "
– 6·8	1·14	1·07	0·02	0·14	Yellow, bright	" " ..	Wall & Co., Market Sq. "
.. 11·4	1·43	1·35	0·02	0·17	Pale red, cl'dy.	" " ..	" " "
— 9·8	1·60	1·47	0·01	6·20	Red, bright...	" " ..	L. Laberge, Albion H'tl. "
— 10·3	1·27	1·15	0·03	0·15	" ...	Alcohol added; adult'd.	Kennedy & Co., Well'n st. "
— 14·8	1·32	1·23	0·02	0·17	" ..	" " ..	" " "
—19·5	0·825	0·619	0.165	0·170	Deep red, clear	I am of opinion that about 6 p.c. of sugar has been added.	E. Brown & Co., Peterborough.
+ 5·5c	0·549	0.406	0·114	0·205	Purple red, clear.	About 8 p.c. of sugar added.	Dagman & Co., Peterborough.
—29·3	0·719	0·568	0·121	0·160	Pale yellow, clear.	About 10 p.c. of sugar added.	" "
0·00	0·515	0·430	0·068	0·105	Yellowish white, clear.	About 3 p.c. of sugar added.	The Hoskins Wine Co., Hamilton.
—30·0	0·609	0·513	0 077	0·130	Yellow, clear	About 14 p.c. of sugar added, and some spirit	" " ..
—14·0	0·738	0.577	0·128	0·100	White, clear.	About 10 p.c. of sugar added.	J. O. Carpenter, Hamilton.
—41·7	0·734	0·610	0·099	0·115	Yellow, clear	About 16 p.c. of sugar added.	Rossin House liquor store, Toronto.
—20·0	0·670	0·566	0·083	0·200	" ..	About 15 p.c. of sugar added.	" " ..
—28·2	0·746	0·565	0·085	0·150	Red, clear....	About 13 p.c. of sugar added.	Michie & Co., Toronto.
—25·17	0·799	0·619	0·083	0·220	.....	About 15 p.c. of sugar added.	Wm. Mara, Toronto.
- 5·50	·644	·315	·263	·110	Red, clear....	Has had foreign sugar used.	Walsh Bros., Stratford, Ont.
– 2·50	·796	·466	·263	·110	Pale, clear....	" ..	T. F. Quirk, Stratford, Ont.
– 3·5	822	·548	·219	·175	Very deep wine red, clear.	" ..	J. Wilson, London, Ont.
- 4·8	·877	·723	·123	·195	" ..	" ..	E. B. Smith "
– 2·0	740	·553	·149	·190	Clear, red....	Contains added alcohol and foreign sugar.	J. R. Campbell, Windsor, Ont.
– 1·5	·768	·570	·158	·200	"	Foreign sugar added..	" "

APPENDIX E.—INSPECTION OF CANADIAN

Date of Collection.	Description of Sample, Name and Address of Manufacturer or Furnisher, as given by Vendor.	No. of Analyst's Certificate.	No. of Sample.	Result of Specific Gravity. Of the Wine.	Specific Gravity. Dealcoholised Wine.	Alcohol in 100cc. By Wt.	Alcohol in 100cc. Of proof spirit.	Alcohol in 100cc. By Vol.	Total Solids in 100 cc.	Reducing Sugar as Dextrose.
1899.	*Official Analyst, F. T. Harrison, London, Ont.*—Con.					p. c.	p. c.	p. c.	p. c.	p. c.
Nov. 3	Vendor	14154	19321	0·9910	1.0088	11·38	14·32	25·10	2·11	None.
" 4	The Stanford Niagara Falls Co.	14155	19322	1·0353	1·0523	11·61	14·65	25·67	13·01	10·84
" 4	C. Montreiul, Walkerville, Ont.	14156	19323	1·0287	1·0420	8·45	10·65	18·65	10·09	8·75
	Official Analyst, Prof. E. B. Kenrick, Winnipeg.									
" 21	St. David's Vine Growers' Co., Toronto.	11347	17207	1·0405		10·05			14·56	12·51
" 21	T. Bright, Niagara Falls	11348	17208	1·0340		10·89			13·18	10·63
" 21	Not known	11349	17209	1·0507		10·20			17·28	14·50
" 21	J. W. Lee & Co., Toronto	11350	17210	1·0368		9·56			13·49	11 25
" 21	The Hoskins Wine Co., Hamilton.	11351	17211	1·0550		8·74			17·95	14·71
" 21	The Niagara Falls Wine Co.	11352	17212	1·0341		10·81			13·20	10·59
" 21	The Hoskins Wine Co., Hamilton.	11353	17213	1 0453		9·08			15.61	12·63
" 21		11354	17214	1·0506		10·20			17·26	14·37
" 21	The Niagara Falls Wine Co.	11355	17215	1·0340		11·02			13·23	10·60
" 21		11356	17216	1·0340		11·02			13·25	10·66
	Official Analyst, Dr. C. J. Fagan, Victoria, B.C.									
13	Stanford Wine Co., Ontario	15065	20162	1·0385	1·0574	7·13	8·88	15·56	12·39	....
" 13	Hoskins Wine Co., Hamilton.	15066	20163		1·069	7·93	9·86	17·29	15·00	...
" 13	R. B. Green, Hamilton	15067	20164		1·057	11·31	13·99	24·52	12·39	8·90
" 24	T. G. Bright, Niagara Falls	15068	20168	1·008	1·027	12·00	14·84	26·00	6·80	3·84
" 24	Hoskins Wine Co., Hamilton	15069	20169	1·041	1·058	10·15	12·58	22·06	14·79	12·50
24	Niagara Falls Wine Co.	15070	20170	1·042	1·057	8·78	10·91	19·11	14·55	13·32
" 24	St. David's Wine Co., Toronto.	15071	20171	1·000	1·015	9·21	11·44	20·04	3·73	2·20
" 24	T. G. Bright, Niagara Falls	15072	20172	1·032	1·049	10·31	12 77	22·38	12·48	10·28

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NATIVE WINES—Tabulated Statement—*Concluded.*

Analysis.							
Polarisation.	Acidity in 100cc.			Ash.	Colour and Clearness.	Remarks by Analyst.	Name and Address of Vendor of Sample.
	Total as Tart. Acid.	Fixed as Tart. Acid.	Volatile as Acetic Acid.				
	p. c.	p. c.	p. c.	p. c.			
+ 0·2	·685	·510	·140	·130	Clean red	Probably contains a little added alcohol.	C. J. Stodgate, Windsor, Ont.
— 2·2	·768	·635	·106	·220	"	Foreign sugar added..	J. Garvey, London, Ont.
— 1·40	·521	·389	·106	·150	Fairly clear, red.	Foreign sugar added. The non-saccharine solids very low.	Scandrett Bros. "
+ 0·44	0·579	0·428	0·121	0·212	Red	The spectrum shows a band in the orange; contains added sugar	B. Cleland, Winnipeg, Man.
— 5·48	0·709	0·501	0·166	0·204	"	Spectrum shows no bands; contains added sugar.	Beliseau & Co. "
— 7·88	0·606	0·416	0·152	0·150	"	" " ..	Paul Sala "
+ 0·11	0 594	0·458	0·109	0·225	"	Spectrum shows a band in the orange; contains added sugar.	W. J. Bawlf "
— 7·07	0·515	0·319	0·157	0·150	"	Spectrum shows no bands; contains added sugar.	G. F. & J. Galt "
— 5·50	0·708	0·507	0·161	0·203	"	" " ..	" "
— 6.16	0·595	0·374	0·177	0·195	"	" " ..	Strang & Co. "
— 7·87	0·587	0·408	0 143	0·165	"	" " ..	G. Velie "
— 5·49	0·716	0·501	0·172	0·212	"	" " ..	Richard & Co. "
— 5·48	0·718	0·500	0·174	0·208	"	" " ..	Hudson Bay Co. "
.....	0·856	0·343	0·324	0·176	"	Genuine	Gold Seal Liquor Co., Vancouver, B.C.
.....	0·725	0·443	0·153	0·126	"	....	Hopkirk, Spence & Co., Vancouver.
.....	0·815	0 345	0·180	0·118	"	Added sugar	Weeks & Robson, Vancouver, B.C.
.....	0·94	0·75	0·14	0·20	"	... .	Hugh Urquhart, Vancouver, B.C.
.....	0·195	0·125	0·060	0·204	"	Added sugar.... . ..	Gold Seal Liquor Co., Vancouver, B.C.
.....	0·55	0 44	0·09	0·208	"	"	" "
....	1·22	0·69	0·58	0·156	"	....	J. P. Turner, Vancouver, B.C.
.....	2·25	0·66	1·27	0·204	"	Added sugar.....	Weeks & Robson, Vancouver, B.C.

APPENDIX F.—INSPECTION OF SPIRITS

Date of Collection.	Description of Sample, Name and Address of Manufacturer or Furnisher, as given by Vendor.	No. of Analyst's Certificate.	No. of Sample.	Sp. Gr. at 15·5 C.	By Weight.
1900.	*Official Analyst, Dr. F. X. Valade, Ottawa.*				p. c.
Mar. 3.	Spirits of Camphor—J. Skinner & Co., Ottawa	14675	20671	0·8404	87·65
" 3.	" " G. E. Kennedy, Ottawa.	14676	20672	0·8377	88·88
" 3.	" " H. F. MacCarthy, Ottawa	14677	20673	0·8527	82·42
" 3.	" " W. H. Roger, Ottawa	14678	20674	0·8395	87·92
" 3.	" " Belanger & Co., Ottawa	14679	20675	0·8383	89·00
" 3.	" " W. A. Lloyd, Ottawa.	14680	20676	0·8372	89·04
" 7.	" " F. R. Curry, Brockville..	14681	20677	0·8379	88·56
" 7.	" " A. Fullerton, Brockville.	14682	20678	0·8492	83·77
" 7.	" " J. McCallum, Brockville	14683	20679	0·8478	84·44
	Official Analyst, F. T. Harrison, London, Ont.				
Feb. 9.	Spirits of Camphor—Bradley, Sons & Co., Montreal	14178	19672	0·8705	67·18
" 12.	" " Kerry, Watson & Co., Montreal .	14179	19673	0·8606	71·52
" 12.	" " Evans, Sons & Co., Montreal	14180	19674	0·8473	77·69
" 12.	" " Dart & Chapman, Montreal	14181	19675	0·8509	76·78

OF CAMPHOR—Tabulated Statement.

Result of Analysis.				Remarks by Analyst.	Name and Address of Vendor of Sample.
Alcohol.		Camphor; grams in 100.	Methyl Alcohol.		
By Volume.	Proof Spirits.				
p. c.	p. c.				
91·52	160·38	11·0	None.	Genuine but above the B.P. standard for 1898, alcohol used being too strong and the quantity of camphor too great.	Vendor.
92·45	162·02	11·3	.....	Above the 1898 B.P. standard for alcohol and camphor.	"
87·46	153·27	9·96	None.	A little below standard in alcohol	"
91·72	160·74	10·9	.....	Above the 1898 B.P. standard.....	"
92·54	162·18	12·3	.....	" " "	"
92·57	162·23	12·3	None.	" " "	"
92·21	161·59	10·9	None.	" " "	"
88·52	155·13	9·96	None.	Genuine.....	"
89·05	156·05	10·2	None.	"	"
73·68	129·13	8·6	None.	Below the B.P. standard in spirits and in camphor, and is therefore adulterated.	"
77·56	135·92	8·5	None.	Below the B.P. standard in camphor and a little low in spirit, and is therefore slightly adulterated.	"
82·96	145·38	9·5	None.	A little below the B.P. standard in camphor, and a little above in spirit strength.	"
82·28	144·20	9·0	None.	" " " " ..	"

APPENDIX G.—INSPECTION OF

Date of Collection.		Description of Sample, Name and Address of Manufacturer or Furnisher as given by Vendor.	No. of Analyst's Certificate.	No. of Sample.	Result: Moisture.	Result: Ash.	Result: Reducing Sug Glucose direct.
1899.		*Official Analyst, F. T. Harrison, London, Ont.*			p. c.	p. c.	p. c.
Dec.	23	Honey—Not known	14158	20650	23·0	0·27	73·92
"	23	" Rutherford & Marshall, Toronto	14159	20651	22·3	0·07	79·37
"	23	" Not known	14160	20652	28·5	0·21	72·20
"	23	" "	14161	20653	21·4	0·08	78·91
"	23	" Sent by J. K. Darling, Almonte	14162	20654	20·3	0·03	80·72
"	23	" " "	14163	20655	22·9	0·26	67·57
1900.		*Official Analyst, M. Bowman, Halifax, N.S.*					
April	25	Honey—Simpson Bros., Halifax	12793	16759	35·87	0·19	66·03
"	25	" E. Smith, Falmouth, N S	12794	16760	35·38	0·30	69·30
"	26	" Simpson Bros., Halifax	12795	16761	35·15	0·18	67·25
"	26	" Bowman & Angivine, Halifax	12796	16762	26·64	0·41	46·09
"	26	" Brown & Webb, Halifax	12797	16763	32·21	0·22	72·15
"	30	" Simpson Bros., Halifax	12798	16764	35·87	0·18	68·33
"	30	" W. D. Black, Truro, N.S	12799	16765	29·02	0·09	72·70
May	1	" " "	12800	16766	37·00	0·05	70·50
"	1	" Brown and Webb, Halifax	12801	16767	32·37	0·27	73·75
"	1	" W. D. Black, Truro, N.S	12802	16768	29·80	0·07	71·50
"	1	" Irwin & Sons, Halifax	12803	16769	32·50	0 18	69·60
April	9	" The Ayer Preserving Co., Ayer, Mass., U.S.A.	12788	17701	27·74	0·34	47·39
"	9	" Bowman & Angivine, Halifax	12789	17702	24·30	0·39	41·40
"	10	" " "	12790	17703	27·33	0·35	48·55
"	10	" Colpitts Bros., Pleasant Vale, N.B.	12791	17704	27·42	0·14	71·18
"	10	" Ayer Preserving Co	12792	17705	26·52	0·34	48·32

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HONEY—Tabulated Statement.

OF ANALYIS.							
Reducing Sugar after inversion.	Sucrose.	Sp. rot. power.		Sucrose by Clerget.	Remarks by Analyst.	Name and Address of Vendor of Sample.
		Direct reading.	Invert.			
p. c.	p. c.			p. c.		
74·37	0·43	− 8·0°	— 9·0°	1·05	Unadulterated.....	Mrs. E. M. Bullen, Toronto.
82·53	3·01	—11·6°	—13·6°	2·05	"	John Callicott, Toronto.
72·33	0·12	—11·6°	—11·6°	....	"	James Sutherland, Peterboro.
78·91	.....	— 9·0°	—10·0°	1·05	"	P. Connall & Son, Peterboro.
80·72	...	—13·0°	—14·0°	1·05	"	John Callicot, Toronto.
68·48	0·86	+30·4°	+26·0°	4·81	Adulterated with starch glucose.....	Mrs. E. M. Bullen, Toronto.
.....	.....	—10·80	-14·52	2·78	Genuine....	H. E. Wilson, Windsor, N.S.
72·40	2·94	—11·80	—17·04	3·91	"	R. B. Dakin, Windsor, N.S.
..	.....	—10·84	—15·04	3·13	"	G. C. McDougall, Kentville, N.S.
...	...	132·00	126·94	3·78	Adulterated with glucose....	K. B. Bishop, Kentville, N.S.
73·60	1·37	10·80	—20·02	6·89	Genuine....	H. W. Davison, Wolfville, N.S.
69·35	0·99	—11·36	—14·62	2·43	"	J. B. Maclean, Dartmouth, N.S.
....	....	—10·00	—14·70	3·52	"	S. Thomson, Dartmouth, N.S.
....	.....	—12·54	17·48	3·71	"	Buckley Bros., Halifax, N.S.
77·55	3·61	—10·64	—18·92	6·24	"	H. A. Taylor, Halifax, N.S.
.....	.....	—11·60	—15·18	2·68	"	S. R. Frame, Halifax, N.S.
73·80	3·99	— 6·92	—14·45	5·65	"	John Davison & Son, Rockingham, N.S.
....	....	100·44	92·27	6·11	Adulterated with glucose....	W. A. Porter, St. John, N.B. Not sold as pure honey.
.....	.....	147·96	143·00	3·72	" " ...	C. A. Clark, St. John, N.B.
...	..	102·02	93·54	6·34	" "	M. & H. Gallagher, St. John, N.B. Vendor doubted purity of honey; was left as sample.
....	....	14·32	−18·08	2·80	Genuine.....	W. A. Porter, St. John, N.B.
.....	.....	100·08	93·63	4·82	Adulterated with glucose....	Geo. S. De Forests Sons, St. John, N.B. Left at vendor's as sample.

APPENDIX H.—INSPECTION OF

Date of Collection.	Description of Sample, Name and Address of Manufacturer or Furnisher, as given by Vendor.	No. of Analyst's Certificate.	No. of Sample.	Result of				
				Insoluble.		Sulphuric Acid.	Chlorine.	Lime.
				Total.	Sand.			
1900	*Official Analyst, Dr. F. X. Valade, Ottawa.*			p. c.	p. c.	p. c.	p. c.	p. c.
May 2	Salt—Imported	14701	19901	0·061	0·035	1·021	59.119	0·844
" 2	" Liverpool salt	14702	19902	0·015	None.	0·583	58·415	0·518
" 3	" Imported	14703	19903	0·047	0·012	0·694	58·943	0·554
" 3	" J. T. Morton, London, Eng	14704	19905	0·065	None.	1·281	59·305	1·008
" 3	" Liverpool salt	14705	19906	0·022	0·0044	0·909	58·943	0·848
" 3	" Imported	14706	19907	0·056	0·029	0·665	53·49	0·668
" 9	" Crosse & Blackwell, London, E.	14707	19909	0·026	None.	1·422	59·471	0·652
" 9	" Imported	14708	19910	4·012	0·007	1·222	57·711	2·967
" 9	" Snow Flake Salt Co., Jersey City, N.Y	14709	19911	0·424	0·025	1·124	58·943	0·954
	Official Analyst, F. T. Harrison, London, Ont.							
" 2	Salt—Coleman Bros., salt manufacturers, Seaforth, Ont	14205	19343	0·014	.....	0·480	56·592	0·072
" 3	" Ransford Bros., manufacturers, Stapleton, near Clinton	14206	19344	0·011	.....	0·424	58·714	0·057
" 5	" G. McEwen, manufacturer, Hensall, Ont	14207	19345	0·046	.....	0·784	58·007	0·742
" 5	" Exeter Salt Works, Ont	14208	19346	0·014	.....	0·329	58·360	0·474
" 7	" R. & J. Ransford, manufacturers, Goderich, Ont	14209	19347	0·014	.....	0·667	56·946	0·633
" 7	" P. McEwen, manufacturer, Goderich, Ont	14210	19348	0·021	.....	0·405	56·946	0·461
" 8	" F. Sparling, Wingham Salt Works	14211	19349	0·022	.....	0·718	56·592	0·688
" 9	" Ontario Peoples' Salt and Soda Co., Kincardine	14212	19350	0·010	.....	0·419	56·240	0·407
" 10	" Coleman Bros., manufacturers, Brussells, Ont	14213	19351	0·013	.....	0·836	53·586	0·734

SESSIONAL PAPER No. 14

COMMON SALT—Tabulated Statement.

Analysis.				Remarks by Analyst.	Name and Address of Vendor of Sample.
Magnesia.	Potash.	Soda.	Moisture.		
p. c.	p. c.	p. c.	p. c.		
0·066	0·002	49·90	.....	Coarse grained and dry; SO_3 rather high; some large pieces of mortar or plaster in the salt, probably accidental.	R. Palmer, Ottawa.
0·071	0·017	49·24	.....	Too wet, containing over 5% of water.	Wall & Co. "
0·036	0·025	50·34	.....	Good.....	T. Brown & Co., Brockville.
0·125	0·058	50·43	.....	SO_3 and CaO rather high; fairly good.	J. Culbert "
0·093	0·045	49·30	.....	Coarse grained salt and wet; contains organic matter; SO_3 and CaO rather high; too wet, containing over 2% of water.	J. W. Armstrong, Cornwall.
0·100	0·062	46·87	.....	Too wet, containing over 5% of water.	J. E. Chevrier "
0·082	0.040	50·86	.....	Fine salt, white and dry; good	Fraser & Viger, Montreal.
0·124	0·009	48·79	.....	Fine grain, white and dry; much insoluble matter, including phosphates; unfit for table use, containing too much insoluble matter.	" "
0·099	0·023	50·32	.....	"	" "
0·018	.....	36·56	4·725	.....	Manufacturers.
0·012	.....	37·70	2·250	.....	"
0·012	.....	37·96	2·225	.....	"
0·028	.....	37·90	2·050	.....	"
0·018	.....	37.311	4·400	.....	"
0·015	.....	37·175	5·050	.....	"
0·019	.....	36·777	5·700	.....	"
0·012	.....	36·972	6·100	.....	"
0·014	.....	34·992	9·625	.....	"

APPENDIX I.—INSPECTION OF SALTPETRE—Tabulated Statement.

Date of Collection.	Description of Sample, Name and Address of Manufacturer or Furnisher, as given by Vendor.	No. of Analyst's Certificate.	No. of Sample.	Result of Analysis				Remarks by Analyst.	Name and Address of Vendor of Sample.
				Nitrogen	Nitric Acid.	Potash.	Soda.		
1900.	*Official Analyst, Dr. W. H. Ellis, Toronto.*			p. c.	p. c.	p. c.	p. c.		
May 3	Saltpetre, not known	12449	20701	16·26	62·57	. . .	35·93	Genuine soda saltpetre; but if sold as "saltpetre," I am of opinion that it is adulterated.	Bryson, Graham & Co., Ottawa.
" 3	" "	12450	20702	16·00	61·57	.....	35·36	" "	Hudson & Powell, Ottawa.
" 3	" "	12451	20703	15·41	59·30	0·29	33·87	" "	F. A. Scott, Ottawa.
" 3	" "	12452	20704	14·00	53·87	46·63	. . .	Genuine saltpetre.	J. Williams, Brockville, Ont.
" 3	" "	12453	20705	16·39	63·07	. . . .	36·22	Genuine soda saltpetre; but if sold as "saltpetre," it is adulterated.	T. J. B. Harding, Brockville, Ont.
" 7	" "	12454	20706	16·15	62·14	. . . .	35·68	" "	McRae Bros., Kingston.
" 7	" W. & F. P. Currie & Co., Montreal.	12455	20707	16·25	62·53	. .	35·91	" "	Rigney & Hickey, Kingston.
" 8	" not known	12456	20708	15·16	58·33	17·09	22·25	A mixture of saltpetre and soda saltpetre. If sold as "saltpetre" I consider this adulterated.	T. Martin, Ottawa.
" 8	" "	12457	20709	13·84	53·26	46·44	. . . .	Genuine saltpetre.	J. Skinner & Co., Ottawa.
" 8	" "	12458	20710	14·36	55·26	34·27	9·17	A mixture of saltpetre and soda saltpetre. If sold as "saltpetre" adulterated.	T. L. Pinard, Ottawa.

APPENDIX J.

BULLETIN No. 67—OLIVE OIL.

OTTAWA, December 12, 1899.

E. MIALL, Esq.,

Commissioner of Inland Revenue.

SIR,—In consequence of an application in June last from the General Italian Consulate in Montreal, the Honourable the Minister of Inland Revenue gave instructions that samples of olive oil, as sold throughout the Dominion, should be collected and submitted to the various district analysts for examination, with the view of determining to what extent this article is subject to adulteration.

The samples were collected in July and August of the present year, and their origin and character will be evident from the particulars given in the accompanying tabulated statement. Seventy-five samples were collected in all, and of these 30 were found by the district analysts to be adulterated, 5 doubtful and 40 genuine. The analytical results as well as the opinions of the analysts are given in the table, from which it will be observed that the chief adulterant is cottonseed oil, although other oils are suspected of being present. In fact in a great many cases the adulteration consists in the simple substitution of cottonseed oil for the genuine article. Under section 2 (*e*) 4 of the Adulteration Act, if regarded as food, the 'olive oil' in question is to be deemed to be adulterated because it is an imitation of and sold under the name of another article. If placed under drugs it must also be regarded as adulterated, since it differs from the standard laid down in the British Pharmacopœia. In my report to you of October 10, I called your attention to 25 of these cases of adulteration, and recommended that in these the provisions of the Adulteration Act should be applied. I beg to suggest the publication of the present report.

I have the honour to be, sir,

Your obedient servant,

THOMAS MACFARLANE,

Chief Analyst.

RESULTS of the Examination of

No. of Sample.	Date of Collection.	Quantity Purchased.	Price.	Name and Address of Vendor.	Name and Address of Manufacturer or Furnisher, as given by Vendor.	Specific Gravity at 15·5 C.	Iodine Absorption.
1899.			$ cts.			p. c.	p. c.
				Truro, N.S.			
16723	July 19	1 pt ...	0 35	A. E. Smith, not sold for internal use.	Maritime Drug Co., St. John, N.B.	0·9212	.....
				New Glasgow, N.S.			
16724	" 19	1 "	0 50	G. Carew.....	Brown & Webb, Halifax, N.S....	0·9144	.. ..
				Halifax, N.S.			
16725	" 21	1 " .	0 60	Buckley Bros., Barrington St.	J. Plagniol, Paris, France.....	0·9152	.... .
16726	" 21	1 "	0 50	G. H. Colwell, Barrington St.	Brown & Webb, Halifax.... ..	0·9144	. ....
16727	" 21	1 " ...	0 35	Hattie & Mylins, Hollis St	Leeming & Miles, Montreal.....	0·9140	.....
				St. John, N.B.			
17664	" 17	1 "	0 30	Canadian Drug Co., Prince William St.	Imported from Italy by vendors..	0·9155	....
17665	" 17	1 "	0 25	Silas McDiarmid, 17 Market Square.	Imperial Oil Co., Ltd., St. John, N.B.	0·9150	.....
17666	" 17	1 "	0 40	Chipman, Smith & Co., 41 Charlotte St.	Lyman Sons & Co., Montreal.. ..	0·9150	....
				Moncton, N.B.			
17669	" 26	1 "	0 45	Fairweather Bros	Evans & Sons, Montreal..... ...	0·9150	... ..
				Bathurst, N.B.			
17672	" 28	1 " ...	0 60	Chipman, Smith & Co....	A. C. Smith & Co., St. John, N.B.	0·9155	...
				Quebec.			
19544	13	1 bottle.	0 90	M. W. Coleman, 98 Bridge St.	N. Johnston & Sons, Bordeaux .	0·916	81 20
19545	13	1 " ..	0 75	" " ..	V. A. Hunziker & Fils, Salon.	0·916	83 89
19546	13	1 pt	0 13	C. S. Riverin, Crown St..	Province	0·922	107·94
19547	13	2 bottles	1 00	A. J. Turcotte & Co., Crown St.	Alex. Godillot.....	0·915	83·59
19548	13	1 bottle.	0 50	E. Turcotte, 74 Defosses St	....	0·921	102·66
				Coaticook, P.Q.			
19549	14	1 pt...	0 40	A. W. Sanborn, Charles St	Lyman Sons & Co., Montreal....	0·916	84·13
19550	14	1 " ...	0 50	Dr. Stevenson....	....	0·916	86·24
				Sherbrooke, P.Q.			
19551	" 14	1 " ...	0 25	W. H. Griffith, Wellington St.	....	0·922	108·21
19552	" 14	2 bottles	0 40	D. W. Stenson, King St..	E. Loubon, Nice.....	0·921	109·89
19553	" 14	1 pt....	0 60	J. L. Mathieu, Wellington St.	Lyman, Knox & Co.....	0·916	81·55

75 Samples of Olive Oil.

Results of Analysis.							No. of Sample.	Analyst.	Remarks.
Reaction with Silver Test.	Maumenè's Test. Rise in Temperature	Nitric Acid Test.	Elaidin Test.	Gain on heating and exposure to air.	Colour.	Taste.			
				p. c.					
Black							16723	M. Bowman, Halifax.	Largely composed of cotton seed oil.
Nil							16724	"	Genuine.
Trace							16725	"	do
Nil							16726	"	do
Trace							16727	"	do
Nil							17664	"	do
Slight							17665	"	Doubtful.
"							17666	"	do
Nil							17669	"	Genuine.
Trace							17672	"	do
	42·0 °C.	Yellow.		4·21	Yellow.	Good.	19544	Dr. M. Fiset, Que.	do
	44·0 °C.	"		3·24	"	"	19545	"	do
	81·0 °C.	Dk. brown		5·81	"	Fair	19546	"	Sample has a rather peculiar smell. Adulterated.
	42·0 °C.	Yellowish		4·19	Greenish yellow.	Good.	19547	"	Genuine.
	74·0 C.	Dk. brown		5·27	Yellow.	"	19548	"	Adulterated.
	42·0 C.	Greenish yellow.		4·58	"	"	19549	"	Genuine.
	47·0 °C.	Brownish yellow.		5·80	"	"	19550	"	do
	84·0 °C.	Dk. brown		6·33	"	"	19551	"	Adulterated.
	79·0 °C.	"		6·05	"	"	19552	"	do
	44·0 °C.	Yellow.		5·68	"	"	19553	"	Genuine.

RESULTS of the Examination of

No. of Sample.	Date of Collection.	Quantity Purchased.	Price.	Name and Address of Vendor.	Name and Address of Manufacturer or Furnisher, as given by Vendor.	Specific Gravity at 15·5° C.	Iodine Absorption.
	1899.		$ cts.	*Montreal.*		p. c.	p. c.
19522	July 10	1 bottle.	0 50	P. Daoust, 1830 St. Catherine St.	Laporte, Martin & Co., Montreal	0·9151	84·03
19523	" 10	1 pt ...	0 15	O. A. Bigaouette, 1564 St. Catherine St.	" " ..	0·9236	109·92
19524	" 10	1 "	0 25	" " ..	" " ..	0·9160	88 05
				Huntingdon, P.Q.			
19525	" 11	1 "	0 50	James Fortune, Main St.	.....	0·9245	102·50
19526	" 11	4 small bottles	0 40	R. E. Kelly..	Baron & Gauthier	0·9213	111·73
				St. Johns, P.Q.			
19527	" 11	1 pt....	0 35	Wright & Co., Richelieu St.	Lyman, Sons & Co., Montreal....	0·922	111·63
19528	" 11	1 "	0 50	" " ..	" "	0·9172	84·74
				Three Rivers, P.Q.			
19529	" 27	2 bottles	0 80	Louis Brunelle & Frere ..	Adolphe Puget.....	0·9165	81·80
19541	" 27	1 pt....	0 60	L. A. Hoerner....	... .	0·9165	80·63
				Montreal.			
19542	" 28	1 "	0 40	A. Dini, 2056 St. Catherine St.	Imported	0·9168	79·45
19543	" 28	1 bottle.	0 40	J. E. Manning, 305 St. Antoine St.	A. Morgnes & Fils.....	0·9167	85·38
				Ottawa.			
18433	Aug. 3	1 pt....	0 50	A. L. Pinard, 118 Rideau St.	Barton & Gnester, Bordeaux, France.	0·9186	80·35
18434	" 3	1 "	0 35	M. A. Belanger, Rideau St.	. .. .	0·9232	105·0
18435	" 3	3 bottles (12 oz.)	0 45	Wm. Cunningham, grocer, Rideau St.	J. B. & A. Artand Freres, Marseilles, France.	0·9170	79·6
18436	" 3	16 oz...	0 40	J. S. Brown, druggist. Rideau St.	Lyman, Sons & Co., Montreal....	0·9184	83·3
18437	" 3	12 " ..	0 30	Wm. Moeser, grocer, 29 York St.	J. Loubon, Nice	0·9212	104·0
				Carleton Place, Ont.			
18438	" 4	1 pt....	0 50	W. S. Robertson, druggist.	. .. .	0·9152	82·3

SESSIONAL PAPER No. 14

75 Samples of Olive Oil—*Continued.*

Results of Analysis.							No. of Sample.	Analyst.	Remarks.
Reaction with Silver Test.	Maumenè's Test. Rise in Temperature	Nitric Acid Test.	Elaidin Test.	Gain on heating and exposure to air.	Colour.	Taste.			
				p. c.					
Nil				1·26			19522	Dr. J. B. Edwards, Montreal.	Genuine.
Blackened.				·01			19523	"	Adulterated, being mainly cotton seed oil.
Nil				0·27			19524	"	Genuine.
Darkened.				2·42			19525	"	Adulterated, being chiefly cotton seed oil.
Very black.				2·77			19526	"	do
"				3·67			19527	"	Sold as common olive oil. Adulterated being cotton seed oil.
Nil				4·40			19528	"	Genuine.
"				4·08			19529	"	do
"				1·56			19541	"	do
"				2·82			19542	"	do
Slight brown colour				1·97			19543	"	May contain a trace of cotton seed oil. Adulteration doubtful.
Nearly white & clear	44·5° C.		Solid and pale.	0·14			18433	Dr. F. X. Valade, Ottawa.	Pure.
Dark & muddy	74·5° C.			1·29			18434	"	Adulterated with cotton seed oil.
Cloudy & slight black deposit	45·0° C.		Orange liquid on top.	2·21			18435	"	Doubtful; probably contains a very small percentage of cotton seed oil.
Clear deep orange colour	53·0° C.		Yellow on top and mass too yellow.	1·86			18436	"	Doubtful; probably contains a small percentage of sesami oil.
Turbid & black deposit	74·0° C.		Orange liquid on top.	1·79			18437	"	Adulterated with cotton seed oil.
White & clear	45·0° C.		All solid, slightly too yellow.	1·22			18438	"	Pure.

RESULTS of the Examination of

No. of Sample.	Date of Collection.	Quantity Purchased.	Price.	Name and Address of Vendor.	Name and Address of Manufacturer or Furnisher, as given by Vendor.	Specific Gravity at 15·5 C.	Iodine Absorption.
1899			$ cts.	*Carleton Place*—Con.			p.c.
18439	Aug.	1 pt....	0 40	Dr. D. H. McIntosh, druggist.	.....	0·9210	95·0
				Perth, Ont.			
18440	"	4 1 "	0 35	Bower & Son, druggists..	Elliott & Co., Toronto.....	0·9145	84 0
18441	"	4 16 oz...	0 50	J. F. Kellock; druggist .	Warrick Freres, Grasse, France..	0·9170	88·0
				Brockville.			
18413	July	13 1 pt....	0 50	F. J. Morgan, grocer, King St.	E. Loubon, Nice	0·9232	108·6
18414	"	13 ½ "	0 35	P. K. McMullan, druggist	Lyman & Knox, Toronto . . .	0·9226	97·35
				Trenton, Ont.			
18415	"	13 1 "	0 50	S. Hooey, grocer..... ...	Crosse & Blackwell, London, E..	0·9167	79·85
18416	"	13 1 "	0 20	A. W. Hawley, druggist..	Not known	0·9241	103·6
				Oshawa, Ont.			
18417	"	14 1 "	0 50	Jury & Gregory, druggists	Elliott & Co., Toronto.....	0·9183	81·04
18418	"	14 1 " . ..	0 69	R. W. & A. Chambers, druggists.	Eurico, Gannie & Co., Leghorn, Italy.	0·9176	79·38
				Toronto.			
18419	"	14 1 " ...	0 60	M. D. Hall, druggist, cor. Queen and York Sts.	Evans & Son, Toronto	0·9177	81·59
18420	"	14 16 oz...	0 40	E. G. Lemaitre, druggist, Queen St.	J. Placinol, Marseille	0·9190	98·50
				Hull, P.Q			
18421	"	19 16 " ...	0 50	M. J. Laverdure, grocer .	Dandicolle & Gondin, Bordeaux .	0·9175	79·44
18422	"	19 ½ pt....	0 25	J. G. Faulkner, druggist.	Evans & Sons, Montreal.....	0·9167	81·35
				Stratford, Ont.			
19259	"	11 1 "	0 40	C. E. Nasmyth & Co., druggists.	J. Winer & Co., Hamilton, Ont..	0·9175	91·37
19262	"	11 1 " .	0 25	Shaver & Co., druggists.	J. Kennedy, druggist, London, Ont.	0·9228	105·10
				London, Ont.			
19263	"	12 1 "	0 25	J. M. Duncan, Dufferin Ave.	J. Kennedy, druggist, London, Ont.	0·9221	111·39
19264	"	12 1 " ...	0 50	C. Symmonds, 468 Dundas St.	Kerry, Watson & Co., London, Ont.	0·9157	82·41
19266	"	12 1 "	0 50	Cairncross & Lawrence, 216 Dundas St.	J. Winer & Co., Hamilton..... .	0·9164	80·61

75 Samples of Olive Oil—*Continued.*

Results of Analysis.									
Reaction with Silver Test.	Maumenès' Test. Rise in Temperature	Nitric Acid Test.	Elaidin Test.	Gain on heating and exposure to air.	Colour.	Taste.	No. of Sample.	Analyst.	Remarks.
				p.c.					
Black & turbid	73·0° C.	.....	.....	3·42	.....	.....	18439	Dr. F. X. Valade, Ottawa.	Adulterated with cotton seed oil.
Straw coloured, clear	49·0° C.	.....	All solid, slightly too yellow.	2·12	.....	.....	18440	"	Pure.
Pale and clear.	45·0 C.	.....	Orange liquid on top.	2·21	.....	.....	18441	"	do
Black ..	.....	D'k brown	No change	3·55	Yellow ...	.....	18413	Dr. W. H. Ellis, Toronto.	Adulterated with cotton seed oil.
" ..	.....	Brown....	"	2·52	Colourless		18414	"	do
No change	.....	No change	"	2·75	Yellow		18415	"	Genuine.
Black ..	.....	Brown....	"	2·66	"		18416	"	Adulterated with cotton seed oil.
No change	.....	No change	Very faint pink tinge	2·65	"		18417	"	Genuine.
"	.....	"	No change	2·82	Green		18418	"	do
"	.....	Lgt brown	.....	2·83	"		18419	"	do
Black ..	.....	Brown....	No change	2·81	Yellow		18420	"	Adulterated with cotton seed oil.
No change	.....	No change	"	3·16	"		18421	"	Genuine.
"	.....	"	"	3·28	Pale yellow. ...		18422	"	do
Very slight darkening.	.....	.....	.....	3·90	.....		19259	F. T. Harrison, London, Ont.	Unadulterated.
Deep r'd brown	.....	.....	.....	4·70	.....		19262	"	Adulterated, being cotton seed oil.
Black ..	.....	.....	.....	5·45	.....		19263	"	do
No change	.....	.....	.....	5·01	.....		19264	"	Unadulterated.
"	.....	.....	.....	4·28	.....		19266	"	do

RESULTS of the Examination of

No. of Sample.	Date of Collection.	Quantity Purchased.	Price.	Name and address of Vendor.	Name and address of Manufacturer or Furnisher, as given by Vendor.	Specific Gravity at 15·5 C.	Iodine Absorption.
1899.			$ cts.	*Windsor, Ont.*			p.c.
19269	July	13 1 pt. ..	0 35	J. Labelle, druggist	.....	0·9228	110·22
19271	"	13 1 "	0 40	H. D. Fleming, druggist.	....	0·9165	81·15
				Woodstock, Ont.			
19273	"	13 1 " .. .	0 40	Fraser & Gunn, druggists.	J. Kennedy, London, Ont....	0·9169	83·22
19275	"	13 1 " ...	0 40	J. H. Nasmyth, druggist.	....	0·9220	108·80
				Winnipeg, Man.			
17167	"	28 1 " .	0 50	Thos. Jobin	Crosse & Blackwell, London, E..	0·9165	82·75
17168	"	28 1 "	0 40	Collin & Son	J. Loubon, Nice	0·9231	115·6
17169	"	29 1 "	0 60	Hudson's Bay Co.....	Johnson & Sons, Bordeaux, France	0·9166	84·33
17170	Aug.	2 1 "	0 50	Collin & Son	Adolphe Puget, Marseilles, France.	0·9195	99·84
17171	"	2 1 "	0 60	J. G. Hargrave & Co ...	J. B. & A. Artand Bros., Marseilles.	0·9215	105·2
17172	"	3 1 "	0 35	The Bole Drug Co.....	Adolphe Puget, Marseilles. .	0·9181	89·31
17173	"	3 1 "	0 40	"	"	0·9167	85·02
17174	"	3 1 "	0 40	The Martin Bole Wynne Co.	"	0·9167	85·34
				Vancouver, B.C.			
20125	"	20 1 bottle.	0 25	A. E. Phœnix, 35 Hastings St.	E. & T. Pinks, London, E....	0·9170	81·97
20129	"	20 1 " ..	0 75	J. Donald & Co., 318 Carroll St.	C. M. Gifford, California.....	0·9178	86·34
20132	"	20 1 " ..	0 25	Blanchfield & Co., 205 Carroll St.	Bunnel Bros., Marseilles	0·9228	109·78
20133	"	20 1 " ..	1 00	R. G. McPherson, 436 Cardova St.	....	0·9170	80·56
20134	"	21 1 " . .	0 30	C. E. Turner, Columbia St.	J. Loubon, Nice, France	0·9229	111·59
				New Westminster, B.C.			
20137	"	21 1 " ..	0 40	E. J. Rae.....	Crosse & Blackwell, London, E..	0·9168	81·09
20138	"	21 1 " .	0 75	D. S. Curtis.	. ...	0·9161	81·60
20139	"	21 1 " ..	0 75	T. A. Muir & Co	. . . .	0·9164	80·54

75 Samples of Olive Oil—*Concluded.*

Results of Analysis.							No. of Sample.	Analyst.	Remarks.
Reaction with Silver Test.	Maumené's Test. Rise in Temperature	Nitric Acid Test.	Elaidin Test.	Gain on heating and exposure to air.	Colour.	Taste.			
				p.c.					
Black				5·71			19269	F. T. Harrison, London, Ont.	Adulterated, being cotton seed oil.
No change				4·77			19271	"	Unadulterated.
Greenish tinge				5·40			19273	"	do
Black				5·15			19275	"	Adulterated, being cotton seed oil.
No reduction							17167	Prof. E. B. Kenrick, Winnipeg, Man.	Genuine.
Reduction.							17168	"	Adulterated, apparently pure cotton seed oil.
No reduction							17169	"	Genuine.
"							17170	"	Adulterated, probably peanut oil.
Reduction.							17171	"	Adulterated with cotton seed oil.
"							17172	"	do
No reduction							17173	"	Genuine.
"							17174	"	do
Greenish black							20125	Dr. C. J. Fagan, New Westminster, B.C.	Adulterated with cotton seed oil.
Unchanged							20129	"	Genuine.
Greenish black							20132	"	Adulterated with cotton seed oil.
Unchanged							20133	"	Genuine.
Greenish black							20134	"	Adulterated with cotton seed oil.
"							20137	"	do
"							20138	"	do
"							20139	"	do

APPENDIX K.

BULLETIN No. 68.—BAKING POWDERS.

OTTAWA, April 6, 1900.

W. J. GERALD, Esq.,
Acting Commissioner of Inland Revenue.

SIR,—In accordance with the instructions of the Commissioner of Inland Revenue a collection of samples of baking powders was made in September, 1899. The following is a statement of the number obtained in each revenue district and shows the classes to which they belong :—

Name of District.	Nature of Acid Constituents.			Total Number Collected.
	Cream of Tartar.	Alum and Acid Phosphate.	Alum.	
Halifax	18	2	2	22
Quebec	2	16	2	20
Montreal	6	16	.....	22
Ottawa	8	4	6	18
Toronto	2	12	6	20
London	4	10	4	18
Winnipeg	2	14	4	20
Vancouver	2	14	.....	16
	44	88	24	156

These figures show that over 70 per cent of the baking powders sold in Canada contain alum, mostly associated with acid phosphate, and that 15 per cent of the total number of samples collected were made up of bi-carbonate of soda and burnt alum without any other acid constituent. On January 9 last I recommended that legal proceedings should be taken in five of these cases, in order to obtain authoritative decisions as to the lawfulness of using alum in baking powers. This was not deemed advisable, although I have no doubt that the practice would be condemned by the courts. There has not been any difficulty in obtaining judgment against parties using alum in bread, but it was not so easy in the case of baking powder, which was not regarded as an article of food. In May, 1888, an amendment to the Adulteration Act declared that 'The expression "food" includes every article used for food or drink by man or cattle 'and every ingredient intended for mixing with the food or drink of man or cattle for 'any purpose whatsoever.' Under this clause it would appear to be quite possible to obtain a judgment in Canada against the use of alum in baking powders.

The same difficulty existed in England until 1899, when the "Sale of Food and Drugs Act" was passed, section 26 of which reads as follows:—'For the purposes of 'the Sale of Food and Drugs Acts, the expression "food" shall include every article used 'for food or drink by man, other than drugs or water, and any article which ordinarily 'enters into or is used in the composition or preparation of human food, and shall 'also include flavouring matters and condiments.' In consequence of this enactment, prosecutions for using alum in baking powders are becoming frequent and successful in England. In order that the situation there may be thoroughly understood the following newspaper reports may be quoted:—

ALUM IN BAKING POWDER.

Heber Hunt, grocer, of Wooton Bassett, for whom Mr. A. E. Withy appeared, was summoned for selling baking powder not of the nature demanded. Mr. Samuel Smith, inspector of food and drugs, said that on February 5 he called in the defendant's shop and purchased three packets of baking powder, for which he paid threepence. Defendant served him, and witness told him his object in purchasing the powders. The samples were divided and defendant given one. The analysis of Dr. Dyer showed the powders to contain alum 22 parts, bi-carbonate of soda 13 parts and farinaceous matter 65 parts. Alum should not be used at all, but tartaric acid, the difference in the cost being that £5 or £6 per cwt. would have to be paid for tartaric acid whilst the same quantity of alum could be obtained for 5s. or 6s.

By Mr Withy: The Act of 1899 first made this an offence. No notice had been given the defendant.

The Bench decided to convict, but only fined the defendant the small penalty of 1s. and costs, owing to the fact that the order had only included baking powder since last year.

Mr. Withy remarked that there was going to be quite an epidemic in the district in regard to baking powder.

The Chairman: Well, we must have proper food.

There was a similar charge against James E. Watts, grocer, of Wootton Bassett, and the Bench dealt with the case in the same way as the last.

At Chippenham, Wilts, on March 1, John Henry Harding, grocer, was charged by Inspector Smith, for the Wilts County Council, under Section 6 of the Act of 1875. Mr. Bevir appeared for the council. Defendant was not legally represented. Mr. Bevir said that Mr. Smith caused to be purchased at the defendant's shop in the market place, Chippenham, a packet of baking powder labelled 'Alpine Baking Powder,' prepared by H. Matthews, of 67 High Street, Plymouth. No doubt Mr. Harding bought and sold the article in question in the ordinary course of trade, but it was sold to the prejudice of the purchaser and was not of the quality demanded. The analysis showed that there was at least 14 per cent of alum in it. The label stated that the article was most nutritious and a great preventative of indigestion, but the analysis proved that to be diametrically untrue. This was not a fancied complaint, but one that went to the root of the case meant to be dealt with by the Act. Baking powder should contain tartaric acid, which cost about £5 per cwt., whilst alum cost about 5s. Mr. Harding admitted selling the powder, but had no idea that it was adulterated, and bought it at a fair commercial price.

The chairman said they would take it that the defendant was ignorant of the ingredients, but he should not sell an article as described unless he got a guarantee. That was the first case that had come before them; but they wished to point out that the whole onus fell on the retailer. For the benefit and protection of the public they were obliged to administer the law, but they would in this case only inflict the mitigated penalty of £3, to include costs.

The injurious nature of alum in baking powders has been fully discussed by my assistant, Mr. A. McGill, B.A., in a report appended hereto. Many of the samples above mentioned were submitted to the district analysts, but a great deal of additional work has been done by Mr. McGill, and a large number of new analyses made. Mr. McGill has described these fully in the same report or in the tables following it. The duplicate samples have been enumerated independently and regarded as separate samples, which they really were, being contained in separate tins. The numbers and descriptions of these, as well as the names of the vendors and manufacturers are given in Table I, which also shows by whom the analyses were made. The results of the analyses have been classified and arranged in the Tables II, III and IV which follow Mr. McGill's report. I beg to recommend the publication of this bulletin.

I have the honour to be, sir,

Your obedient servant,

THOMAS MACFARLANE,

Chief Analyst

TABLE I.—BAKING POWDERS.

Samples.	Date of Collection	Quantity Purchased	Price.	Name of Brand.	Name and Address of Vendor.	Name and Address of Manufacturer.	Analyst.
	1899.		$ cts.				
16,734*a*	Sept. 7	3 tins	0 60	Royal	W. H. Smith, Kentville, N.S	Royal Baking Powder Co., New York	Bowman.
16,734*b*	" 7	3 "	0 60	"	" "	" "	McGill.
16,735*a*	" 8	3 pkgs. (6 ozs.)	0 30	Woodill's German	C. P. Smith, Windsor, N.S	W. D. Pearman, Halifax, N.S	Bowman.
16,735*b*	" 8	3 "	0 30	"	" "	" "	McGill.
16,737*a*	" 11	3 tins, ½lb.	0 45	Fairy	W. E. Crowe & Co., Gottingen St., Halifax	E. C. Howe, Halifax	Bowman.
16,737*b*	" 11	3 " "	0 45	"	" "	" "	McGill.
16,740*a*	" 11	3 "	0 15	Renown	A. M. Boutilier & Co. "	Eastern Chemical Co., Halifax	Bowman.
16,740*b*	" 11	3 "	0 15	"	" "	" "	McGill.
16,741*a*	" 12	3 pkgs	0 21	English Cream	A. L. Doyle & Co., Lower Water St., Halifax	E. F. Dalley Co., Hamilton, Ont.	Bowman.
16,741*b*	" 12	3 "	0 21	"	" "	" "	McGill.
16,743*a*	Oct. 4	3 tins	0 30	Maple Leaf	Mrs. A. Z. Gates, Lunenburg, N.S.	G. A. Parker, Lunenburg, N.S	Kenrick.
16,743*b*	" 4	3 "	0 30	"	" "	" "	McGill.
17,183*a*	Sept. 19	3 " 3 lbs.	0 75	West End	Hardy & Buchanan, Winnipeg, Man	The Dyson Gibson Co., Winnipeg, Ont.	Kenrick.
17,183*b*	" 19	3 " "	0 75	"	" "	" "	McGill.
17,184*a*	" 19	3 "	0 60	Climax	T. E. Williams "	R. Ralston & Co., Hamilton, Ont	Kenrick.
17,184*b*	" 19	3 "	0 60	"	" "	" "	McGill.
17,185*a*	" 19	3 "	0 75	Gold Standard	Weldon & Co. "	Codville & Co., Winnipeg, Man.	Kenrick.
17,185*b*	" 19	3 "	0 75	"	" "	" "	McGill.
17,186*a*	" 20	3 " 2 lbs.	0 30	White Star	C. Reid & Co. "	The Dyson Gibson Co., Winnipeg	Kenrick.
17,186*b*	" 20	3 " 2 "	0 30	"	" "	" "	McGill.
17,187*a*	" 20	3 " 3 "	0 75	Smith's Cream	W. J. Smith & Co. "	" "	Kenrick.
17,187*b*	" 20	3 " 3 "	0 75	"	" "	" "	McGill.
17,188*a*	" 20	3 " 3 "	0 75	Hallonquist's Cream	A. Hallonquist "	F. F. Dally & Co., Hamilton, Ont.	Kenrick.
17,188*b*	" 20	3 " 3 "	0 75	"	" "	" "	McGill.
17,189*a*	" 20	3 " 3 "	0 75	Jubilee	A. J. Collin, St. Boniface, Man	" "	Kenrick.
17,189*b*	" 20	3 " 3 "	0 75	"	" "	" "	McGill.
17,190*a*	" 20	3 " 3 "	1 35	Price's Cream	A. Leveque "	Price's Baking Powder Co., Chicago.	Kenrick.
17,190*b*	" 20	3 " 3 "	1 35	"	" "	" "	McGill.
17,191*a*	" 20	3 " 3 "	0 60	White Star	C. A. Lavoie "	The Dyson Gibson Co., Winnipeg, Man	Kenrick.
16,191*b*	" 20	3 " 3 "	0 60	"	" "	" "	McGill.
17,192*a*	" 20	3 " 3 "	0 75	Gold Standard	T. Pelletier "	Codville & Co. "	Kenrick.
17,192*b*	" 20	3 " 3 "	0 75	"	" "	" "	McGill
17,674*a*	" 5	3 " ¼lb	0 30	Dearborn's Perfect	Dearborn & Co., 75 Prince Wales St., St. John, N.B.	Vendors	Bowman.
17,674*b*	" 5	3 " ¼ "	0 30	"	" "	"	McGill.
17,675*a*	" 5	3 " ¼ "	0 30	Royal	T. E. Williams, 80 Charlotte St., St. John	Royal Baking Powder Co., New York	Bowman.

17,675*b*	"	5	3	"	0	30	"	"	McGill.
17,676*a*	"	5	3	"	0	60	Cream	McPherson Bros., 181 Union St., St. John..	Price's Baking Powder Co., New York	Bowman.
17,676*b*	"	5	3	"	0	60	"	"	"	McGill.
17,679*a*	"	12	3	pkgs	0	75	Magic	Inches & Grimmer, Water St., St. Stephen, N.B.	E. W. Gillett, Toronto	Bowman.
17,679*b*	"	12	3	"	0	75	"	"	"	McGill.
17,681*a*	"	14	3	tins, ½-lb.	0	30	Dearborn's Perfect	Burt & Coburn, Fredericton, N.B	Dearborn & Co., St. John, N.B	Bowman.
17,681*b*	"	14	3	"	0	30	"	"	"	McGill.
18,460*a*	Aug.	31	1	lb	0	20	Barley Cream	E. H. Breckenridge, Aylmer, Que		Valade.
18,460*b*	"	31	1	"	0	20	"	"		McGill.
18,461*a*	"	31	1	"	0	25	Windsor	A. Z. Trudel, Hull, Que	Marrotte LeBlanc & Co., Montreal	Valade.
18,461*b*	"	31	1	"	0	25	"	"	"	McGill.
18,462*a*	Sept.	1	1	"	0	25	Paradise	G. W. Armstrong, Cornwall, Ont	W. H. Gillard & Co., Hamilton	Valade.
18,462*b*	"	1	1	"	0	25	"	"	"	McGill.
18,463*a*	Aug.	31	1	"	0	25	English Cream	J. E. Chevrier	F. F. Dalley & Co., Hamilton	Valade.
18,463*b*	"	31	1	"	0	25	"	"	"	McGill.
18,464*a*	"	31	1	"	0	25	Kennedy's	J. Kennedy, Druggist, Sparks St., Ottawa..	Vendor	Valade.
18,464*b*	"	31	1	"	0	25	"	"	"	McGill.
18,465*a*	Oct.	7	1	"	0	20	Cook's Friend	Mrs. P. J. Cleary, Nicholas St., Ottawa	W. D. McLaren, Montreal	Valade.
18,465*b*	"	7	1	"	0	20	"	"	"	McGill.
18,466*a*	"	7	1	"	0	20	Fanning's Malt	"	J. J. Fannings & Co., Ltd., Ottawa	Valade.
18,466*b*	"	7	1	"	0	20	"	"	"	McGill.
18,467*a*	"	7	½	"	0	25	Royal	Geo. Forde, Rideau St., Ottawa	Royal Baking Powder Co., New York	Valade.
18,467*b*	"	7	½	"	0	25	"	"	"	McGill.
18,468*a*	"	7	6	oz	0	25	Cleveland	C. Waterston, Nicholas St., Ottawa	Cleveland Baking Powder Co., New York	Valade.
18,468*b*	"	7	6	"	0	25	"	"	"	McGill.
18,469*a*	Sept.	7	1	lb	0	13	Dairy Cream	J. A. Sweet, 481 Queen St., East Toronto	Prue Gold Mfg. Co., Toronto, Ont	Ellis.
18,469*b*	"	7	1	"	0	13	"	"	"	McGill.
18,470*a*	"	7	1	"	0	10	Daisy	"	Globe Mills Baking Powder Co., Toronto	Ellis.
18,470*b*	"	7	1	"	0	10	"	"	"	McGill.
18,471*a*	"	7	1	"	0	25	Charm	Jas. Cork & Co., 348 Queen St., E. Toronto	Toronto Coffee and Spice Co	Ellis.
18,471*b*	"	7	1	"	0	25	"	"	"	McGill.
18,472*a*	"	7	1	"	0	25	Jersey Cream	W. J. Coutts & Co., 223 Parliament St., Toronto.	Lumsden Bros., Standard Mills	Ellis.
18,472*b*	"	7	1	"	0	25	"	"	"	McGill.
18,473*a*	"	7	1	"	0	15	Reliance	W. Roland, York St., Hamilton	Not known	Ellis.
18,473*b*	"	7	1	"	0	15	"	"	"	McGill.
18,474*a*	"	7	1	"	0	40	Perfection	Galvin Harrigan, Cor. York and Park Sts	John W. Gerrie, druggist, Hamilton	Ellis.
18,474*b*	"	7	1	"	0	40	"	"	"	McGill.
18,475*a*	"	7	1	"	0	15	Champion	C. Lee, 101 King St., Hamilton	F. F. Dally & Co., Hamilton	Ellis.
18,475*b*	"	7	1	"	0	15	"	"	"	McGill.
18,476*a*	"	7	3	pkgs., 12 oz	0	30	Cook's Best Friend	Mrs. John McLean, 37 James St., St. Catharines.	W. G. Dunn & Co., Hamilton	Ellis.
18,476*b*	"	7	3	" 12 "	0	30	"	"	"	McGill.
18,477*a*	"	7	3	tins 12 "	0	30	Ocean Wave	Flynn Bros., James St., St. Catharines.	Hamilton Coffee and Spice Co	Ellis.
18,477*b*	"	7	3	" 12 "	0	30	"	"	"	McGill.
18,478*a*	"	7	3	" 18 "	0	30	Magic	J. Merriman, St. Catharines	E. W. Gillett, Toronto	Ellis.
18,478*b*	"	7	3	" 19 "	0	30	"	"	"	McGill.
19,296*a*	"	6	1	lb	0	15	Barton's P. B.	A. J. Fitzsimmons, Guelph, Ont	Toronto Coffee and Spice Co	Harrison.
19,296*b*	"	6	1	"	0	15	"	"	"	McGill.

TABLE I.—BAKING POWDERS—*Continued.*

Sample.	Date of Collection	Quantity Purchased.	Price	Name of Brand.	Name and Address of Vendor.	Name and Address of Manufacturer	Analyst.
	1899.		8 cts.				
19,297*a*	Sept. 6	1 lb	0 30	Mayell's Cream	P. Anderson Guelph, Ont.	Mayell & Co., Toronto	Harrison.
19,297*b*	" 6	1 "	0 30	"	" "	" "	McGill.
19,298*a*	" 6	1 "	0 20	Dominion	Jackson & Son., 17 Wyndham St., Guelph	Pure Gold Mfg. Co., Toronto, Ont	Harrison
19,298*b*	" 6	1 "	0 20	"	" "	" "	McGill.
19,299*a*	" 7	1 "	0 15	Ocean Wave	E. O. Flaherty, Stratford, Ont.	Hamilton Spice and Coffee Co.	Harrison.
19,299*b*	" 7	1 "	0 15	"	" "	" "	McGill.
19,300*a*	" 7	1 "	0 30	Crystal	The Barnsdale Trading Co., Stratford, Ont.	Snow Drift Baking Powder Co., Brantford	Harrison.
19,300*b*	" 7	1 "	0 30	"	" "	" "	McGill.
19,301*a*	" 7	1½ "	0 25	Forest City	A. G. Lloyd, Stratford, Ont	Gorman, Eckert & Co., London, Ont.	Harrison.
19,301*b*	" 7	1½ "	0 25	"	" "	" "	McGill.
19,302*a*	" 7	1 "	0 25	Cook's Best Friend	T. A. Rowat, London, Ont	W. G. Dunn & Co., Hamilton	Harrison.
19,302*b*	" 7	1 "	0 25	"	" "	" "	McGill.
19,303*a*	" 7	1 "	0 25	Salvador	J. C. Trebilcock "	Salvador Mfg. Co., London, Ont	Harrison.
19,303*b*	" 7	1 "	0 25	"	" "	" "	McGill.
19,304*a*	" 7	1¼ lbs.	0 38	Strong's	Somerville & Co., London, Ont	W. T. Strong & Co., druggist, London	Harrison.
19,304*b*	" 7	1¼ "	0 38	"	" "	" "	McGill.
19,564*a*	" 5	3 tins.	0 45	Imperial	W. Briltcliff, 552 St. Antonio St., St. Henri, Que.	E. W. Gillett, Toronto	Edwards.
19,564*b*	" 5	3 "	0 45	"	" "	" "	McGill.
19,565*a*	" 5	3 "	0 25	Eagle	" "	Eagle Baking Powder Co.	Edwards.
19,565*b*	" 5	3 "	0 25	"	" "	" "	McGill.
19,566*a*	" 5	3 "	0 45	Gem	A. E. Blanchard, 227 Coursol St., St. Cunegonde, Que.	Hudon & Orsali, Montreal	Edwards.
19,566*b*	" 5	3 "	0 45	"	" "	" "	McGill.
19,567*a*	" 5	3 "	0 45	Royal	G. W. Barsalo, 1067 St. James St., Montreal	Royal Baking Powder Co., New York	Edwards.
19,567*b*	" 5	3 "	0 45	"	" "	" "	McGill.
19,568*a*	" 5	3 "	0 30	Pure Gold	" "	Pure Gold Mfg. Co., Toronto	Edwards.
19,568*b*	" 5	3 "	0 30	"	" "	" "	McGill.
19,569*a*	" 19	2 lbs.	0 27	Crystal	J. R. McOuat, Lachute, Que	" "	Edwards.
19,569*b*	" 19	2 "	0 27	"	" "	" "	McGill.
19,570*a*	" 19	2 "	0 27	Daisy Cream	" "	" "	Edwards.
19,570*b*	" 19	2 "	0 27	"	" "	" "	McGill.
19,571*a*	" 20	2 "	0 21	Kitchen Queen	Josh. Brodeur, 222 Cascade St., St. Hyacinthe, Que.	F. F. Dally & Co., Hamilton	Edwards

19,571*b*	"	20	2	"	0	21	"	"	"	McGill.
19,572*a*	"	20	18	oz.	0	24	Newman's	J. Dumont, 233 Cascade St., St. Hyacinthe, Que.	Century Co., Picton, Ont	Edwards.
19,572*b*	"	20	18	"	0	24	"	"	"	McGill.
19,573*a*	"	20	2½	lbs.	0	25	Cooks' Pride	T. J. Bourgeois, 203 Cascade St	H. T. Pacaud & Co., Montreal	Edwards.
19,573*b*	"	20	2½	"	0	25	"	"	"	McGill.
19,574*a*	"	20	2	"	0	35	Vienna	Pagnuelo Frères, Cascade St., St. Hyacinthe, Que.	S. H. & A. S. Ewing, Montreal, Que	Edwards.
19,574*b*	"	20	2	"	0	35	"	"	"	McGill.
19,586*a*	"	12	3	tins.	0	30	Cooks' Favorite	A. A. Cantin, 555 St. Valier, Quebec, Que.	J. J. Duffy Co., Montreal	Fiset.
19,586*b*	"	12	3	"	0	30	"	"	"	McGill.
19,587*a*	"	12	3	"	0	30	Cooks' Choice	Wm. Treggett, 111 St. John St., Quebec, Que	Pure Gold Mfg. Co., Toronto	Fiset.
19,587*b*	"	12	3	"	0	30	"	"	"	McGill.
19,588*a*	"	13	3	"	0	30	Cooks' Delight	J. Raymond & Co., St. Anne de Beaupré	Drouin Frères, New York	Fiset.
19,588*b*	"	13	3	"	0	30	"	"	"	McGill.
19,589*a*	"	13	1	lb.	0	30	Pearce	J. A. Moisan, 341 St. John St., Quebec, Que.	Century Co., Picton, Ont	Fiset.
19,589*b*	"	13	1	"	0	30	"	"	"	McGill.
19,590*a*	"	13	1	"	0	25	Windsor	"	Marrotte & Leblanc, Montreal	Fiset.
19,590*b*	"	13	1	"	0	25	"	"	"	McGill.
19,591*a*	"	13	3	tins.	0	30	Lily White	J. Picard, 32 Henderson St., Quebec, Que.	Bulard et Frère, Quebec	Fiset.
19,591*b*	"	13	3	"	0	30	"	"	"	McGill.
19,592*a*	"	14	3	"	0	30	Cooks' Pride	J. P. Guy, 152 St. Joseph St., Quebec, Que.	A. F. Pacaud & Co., Montreal, Que.	Fiset.
19,592*b*	"	14	3	"	0	30	"	"	"	McGill.
19,593*a*	"	14	3	"	0	30	Eagle	R. McCrae, Main St., Richmond, Que	Eagle Baking Powder Co., Montreal	Fiset.
19,593*b*	"	14	3	"	0	30	"	"	"	McGill.
19,594*a*	"	14	3	"	0	27	Cooks' Friend	Grimes & Elliott, Richmond, Que	W. D. McLaren, Montreal, Que	Fiset.
19,594*b*	"	14	3	"	0	27	"	"	"	McGill.
19,595*a*	"	14	3	"	0	30	On Top	J. Bedard, Main St., Richmond, Que	Gendron & Denault, Sherbrooke	Fiset.
19,595*b*	"	14	3	"	0	30	"	"	"	McGill.
20,143*a*	"	12	12	oz.	0	20	Golden Crown	S. Cobb, Cordova St., Vancouver, B. C.	W. Tufts & Son, Vancouver	Fagan.
20,143*b*	"	12	12	"	0	20	"	"	"	McGill.
20,144*a*	"	12	1	lb.	0	25	Kitchen Queen	George Wagg, Water St	F. F. Dalley Co., Hamilton, Ont	Fagan.
20,144*b*	"	12	1	"	0	25	"	"	"	McGill.
20,146*a*	"	12	12	oz.	0	25	Magic	Mrs. Stoffard, Abbott St., Vancouver, B.C.	E. W. Gillett, Toronto	Fagan.
20,146*b*	"	12	12	"	0	25	"	"	"	McGill.
20,147*a*	"	12	1	lb.	0	25	Purity	C. Uchida, Hastings St., Vancouver, B. C.	Purity B. P. Co., Toronto, Ont	Fagan.
20,147*b*	"	12	1	"	0	25	"	"	"	McGill.
20,149*a*	"	12	12	ozs.	0	20	Ocean Wave	Blanchfield & Co., Hastings St., Vancouver, B.C.	Hamilton Coffee and Spice Co	Fagan.
20,149*b*	"	12	12	"	0	20	"	"	"	McGill.
20,152*a*	"	12	1	lb.	0	45	Regal	Parrett & Co., Columbia St., New Westminster, B.C.	Pure Gold Mfg. Co., Toronto	Fagan.
20,152*b*	"	12	1	"	0	45	"	"	"	McGill.
20,153*a*	"	12	12	oz.	0	25	Blue Ribbon	McKenzie Bros., Columbia St., New Westminster, B.C.	Blue Ribbon Mfg. Co., Winnipeg, Man	Fagan.
20,153*b*	"	12	12	"	0	25	"	"	"	McGill.
20,156*a*	"	12	12	"	0	25	White Star	C. A. Welsh, New Westminster, B.C.	The Gibson Co., Winnipeg, Man	Fagan.
20,156*b*	"	12	12	"	0	25	"	"	"	McGill.

TABLE I. BAKING POWDER—*Concluded.*

Sample.	Date of Collection	Quantity Purchased.	Price	Name of Brand.	Name and Address of Vendor.	Name and Address of Manufacturer.	Analyst.
	1900.		$ cts.				
A	Feb.			Cleveland's Superior	Bate & Co., Ottawa		McGill.
B	"			Cooks' Friend	" "		"
C				Imperial	" "		"
D				Kennedy's	J. Kennedy "		"
E				Maple Leaf	Kaulbach, M.P. "		"
F				Price's Cream	Bate & Co. "		"
G				Pure Gold	P. G. Mfg. Co., Toronto		"
H				Royal	Bate & Co., Ottawa		"
I	"			Cream			"
K	Mar			Regal	Parnell & Gunn, New Westminster, B. C.		"
L	"			Fanning's Malt	Bate & Co., Ottawa		"
M	"			Regal	Pure Gold Mfg. Co., Toronto		"

SESSIONAL PAPER No. 14

LABORATORY OF THE INLAND REVENUE DEPARTMENT,
OTTAWA, March 20, 1900.

THOS. MACFARLANE, Esq., F.R.S.C., &c.,
Chief Analyst.

SIR,—I have the honour to submit you herewith a report of work upon 168 samples of baking powder, collected as shown in Table I. In the work of analysis I have received assistance from the different public analysts, as indicated in the tabulated results; but the greater portion of the work has been done in this laboratory. In a part of the work, and especially in an examination into the accuracy of methods for alumina and phosphoric acid estimations, I have during the last week or two received valuable assistance from Mr. F. Connor, analytical chemist of this city.

The samples are classified as follows :—

Cream of tartar powders, Table II	54
Alum powders, Table III	31
Alum and phosphate powders, Table IV	83
	168

Explanatory notes as to methods of analysis accompany the tables so that only some general remarks are called for here,

I believe that in judging of a baking powder the following points should be considered, and I name them in what I conceive to be the order of their importance :—

1. The wholesomeness of the materials used in the powder, both with regard to their characteristics individually and to the nature of the residues which they leave in the bread.
2. Efficiency as gas producers, having regard not only to the total quantity of gas which is evolved, but also to the conditions of temperature, moisture and time as affecting gas production.
3. Keeping qualities.

In Bulletin 10 of this department, published in June, 1889, I expressed my conviction, based on experimental evidence at that time available, that alum in baking powders is dangerous to health.

The large mass of evidence which has since accumulated on this question, has, if possible, more strongly convinced me of the correctness of the opinion I expressed eleven years ago. A very much condensed synopsis of this evidence, with references to the original memoirs, will be found in the following pages :—

In judging of the wholesomeness of a baking powder, I am convinced that it is not enough to prove the harmlessness of the residues left in the bread on the assumption that a perfect chemical reaction has taken place during the making and baking of the dough. The components of baking powders are sparingly soluble in water, and the conditions of cooking require the use of a limited and a variable amount of water, according to the judgment of the cook; so that, I think, we assume too much in supposing that the unchanged components of the powder are never present, as such, in the finished product. Hence the importance of assuring ourselves that these components are, in themselves, not dangerous to health. The importance of this matter appears very great when we further consider that in order to a complete reaction of the components of the powder, not only must they be completely got into solution by the water (or milk) used in making the dough, but they must be present in the baking powder itself in exactly equivalent proportions. This assumes that the manufacturer

took care to prepare his powder upon scientific principles, using properly proportioned ingredients, and thoroughly mixing these together, and also that no separation of these ingredients has since taken place. I have determined the relative densities of maize starch (=1·47), cream of tartar (=1·87), commercial burnt alum (=2·103)—see Table V., No. 14—and bi-carbonate of soda (=2·179.) It will be seen, that gravity can exert but little influence in separating alum and carbonate of soda; but there will be a decided tendency for the starch—which forms about 50 per cent of these powders—to come to the top of the can.

With regard to the baking powders enumerated in Table II., the wholesomeness, both as regards the components themselves, and the residues left in the bread, may be taken as well established. The use of cream of tartar (or tartaric acid) with bicarbonate of soda long ante-dates the commercial baking powder. It is further to be noted that cream of tartar (and tartaric acid) react in a perfectly definite way with bi-carbonate of soda. It is therefore an easy thing for the manufacturer of a tartar baking powder to guarantee to his customers a mixture which shall contain no excess of either acid or basic component, and which shall, in consequence, leave a perfectly neutral residue in the bread. It is quite otherwise with burnt alum, as the following experiments, made with a commercial sample will shew. (See Table V., No. 14.)

On titrating this sample to neutrality (using phenolphthalein as indicator) the following results were obtained. The first neutralization was effected by adding normal soda to a cold solution of the alum until a colour was obtained which persisted for one minute. The subsequent neutralizations were made by adding considerable excess of soda, boiling for the time specified, and titrating back with normal acid:—

Burnt Alum. 100 Grammes.

Conditions.	Required Normal Soda.	Equivalent Bi-carbonate of Soda.
Cold	616	51·7
Boiled 1 minute.	1208	101·5
" 6 "	1484	124·7
" 11 "	1628	136·8
" 16 "	1676	140·8
" 21 "	1724	144·8

These numbers sufficiently illustrate the indefiniteness of this reaction, and the impossibility of deciding exactly how much soda shall be used in an alum powder, to secure a neutral residue in the bread. The last column gives the number of parts by weight of bi-carbonate of soda, which are required for neutralization of 100 parts by weight of the alum sample, and it is evident that in order to ensure the probable absence of alum, as such, in the bread it becomes necessary to use a considerable excess of bicarbonate of soda. Every chemist knows the difficulty of titrating to definite neutrality, burnt alum and soda; and, if instead of using an indicator, like phenolphthalein, we attempt to determine the neutral point by causing burnt alum to react with carbonate of soda until carbon dioxide ceases to be evolved, the exact end of the reaction is still difficult to fix. This is due to the very difficult solubility of burnt alum, and especially to the great insolubility of those basic sulphates of alumina always found in it. But if it be difficult to fix the end of the reaction when large excess of boiling water is the solvent, it is infinitely more difficult to say how far the reaction will be carried in the case of dough-making, where cold water in limited quantity is the solvent. On reference to the appended tables it will be seen that the amount of gas liberated in a well made tartar powder by addition of acid to the residue left on boiling the sample with water, is seldom more than one per cent, and is usually less than

this. In alum and alumphosphate powders it may reach five per cent, or even more, showing a very large excess of bicarbonate of soda in the sample. But even this number does not define the practical excess of soda, since the conditions under which the 'available' gas is given off in the laboratory test are far more favourable to the reaction of the acid and basic components of the powder than are the conditions occurring when dough is made. It follows from these considerations that we should expect to find more or less unchanged alum in the bread made from an alum powder. There are obvious difficulties in the way of experimentally demonstrating this point. Attempts to get this residual alum into solution without at the same time getting the much more soluble residual soda into solution, have proved but partially successful, and it follows that the interaction of the components of the powder, so far as this was incomplete in the making and baking of the bread, is completed in the stomach of the consumer of the bread. A disturbance of gastric digestion would seem to be inevitable, since if alum is in excess, its well known inhibitory action upon the digestive ferments will be exhibited, while, if a large excess of bi-carbonate of soda is present, this will go to neutralize the natural acidity of the gastric juice and cannot but prove harmful. It is evident that experimental proof of the point I have suggested, namely, the presence of unchanged alum in the bread, would render illegal the sale of alum baking powders in those countries (England, France, Germany, etc.), where laws against the presence of alum in bread have been enacted. The failure to convict on appeal in the celebrated Norfolk case (Warren *vs.* Phillips, 1880) resulted from the failure to prove that alum existed in the bread, as such ; even the experts called for the defence being careful to state that they did not wish their evidence to be construed as favourable to the harmlessness of alum in food. What these chemists claimed was that alum did not exist in the bread—although it was present in baking powder—being changed into hydrate of alumina, a substance which they believed to be non-injurious to health.

The question of the harmlessness of hydrate of alumina has, however, not been proven ; and the most that can be said for it is that the case is still unsettled. I may say here that my personal opinion is decidedly against the use of alum. The health of a nation is too serious a matter to be imperilled lightly, and if it be impossible to secure prohibitory legislation against alum baking powders, it is all the more desirable that manufacturers of these powders should be required to state their composition on the packages, so that consumers may know what they buy and use. Until it is demonstrated that hydrate of alumina and (in the case of alum-phosphate powders) phosphate of alumina are harmless substances in food, the use of alum baking powders is attended with a very serious risk ; while not even the proving of these substances harmless would establish the safety of these powders, since, for reasons already mentioned, it is quite uncertain that the reaction is completed in the bread, and the sulphate of soda (Glaubers Salt) which is formed as a second product of decomposition, is a powerful purgative whose continued use cannot be conceived to be without injurious consequences upon the stomach and intestinal canal.

That the state of the case for alum baking powders may be intelligently considered by readers of this bulletin, I append a synopsis of such scientific evidence in the matter as has come under my notice during the interval of eleven years which have elapsed since my last published work on baking powders. (See Bulletin 10, of this Department.)

In the Norfolk Baking Powder case (1879) the powder in question consisted of rice flour, 41·5 per cent, burnt alum, 15·76 per cent, and bicarbonate of soda (with traces of impurities) 42·74 per cent. Mr. J. W. Knights, F.C.S., and Professor M. M. P. Muir, of Caius College, Oxford, and three medical men were called for the prosecution, and affirmed their belief in the harmfulness of this powder. For the defence were called Mr. F. Sutton and Dr. Beverley, who claimed that the powder was harmless on the ground of the insolubility of hydrate of alumina. A fine was imposed, but the case was appealed. On appeal, the Recorder held that the law against alum in food required the prosecutors to prove that in the baking powder itself the alum was mixed with food, and, on this technicality, the appeal was quashed, since it was held that only after its use in baking was the article mixed with food, and then the alum, as such, was no longer present, having been changed into hydrate of alumina. During this trial the following

gentlemen were called by the prosecution :—J. W. Knights, Professor Muir, Dr. Bury and Dr. Paget ; for the defence, Mr. Sutton, Dr. Thudichum and Dr. Tidy. Although men of high standing were called for the defence, and a decision favourable to the manufacturer was obtained, I do not think that this case throws more than incidental light upon the important question of the safety, or otherwise, of alum baking powder.

Professor Patrick, of the University of Kansas (*Scientific American Supplement*, No. 185) made experiments to determine the solubility of hydrate of alumina in the gastric juice by feeding biscuits made with an alum baking powder to cats, killing these after different intervals of time and examining the contents of the stomachs and intestines for dissolved alumina. He found none. On feeding unbaked (gelatinous) alumina however, he found it to go into solution, and concludes that it is not safe to eat *dough* made with alum powder, "it should always be baked." Also "if bread is carelessly mixed, or with insufficient water, some of the powder may remain dry, and the alum not be changed to hydrate, in which case the effect would probably be injurious." On feeding biscuits which had been purposely made with but little water, and imperfectly baked, Prof. Patrick found dissolved alumina in every case, and suggests that as a simple precaution in the use of alum powder, it might be well to mix the batter too thin at first, and stiffen it by the addition of pure flour. Of course if these special precautions are desirable with alum powders, it is of great importance that these powders be distinctly labelled as containing alum.

Professor Ruttan, of McGill College, Montreal, has published (*See* 'Transactions of the Royal Society of Canada, 1887) the results of a series of experiments on the digestibility of bread baked with alum and other powders. The following are his conclusions :—

1. Bread made with tartrate powders is most quickly digested, because the Rochelle salts formed possess a very weak retarding action on ferments.

2. The presence of alkaline sulphates and of the pulpy viscid hydrate and phosphate of alumina among the other decomposition products, is sufficient to explain the relative indigestibility of bread containing these salts.

3. Soluble phosphates do not appear to seriously interfere with the proper action of digestive ferments.

4. While the effect of alum is to entirely prohibit ferment action, that of the products resulting from the use of an alum powder is merely to retard digestion, not entirely to prevent it.

5. The unanimous verdict of my experiments is that alum powders introduce into a form of food of universal use, agents which are detrimental to the functional activity of the digestive ferments. They must therefore be prejudicial to health, and the only course is to carefully avoid them.

J. West Knights, F.C.S., (*The Analyst*, 1880, p. 67), published the results of a series of experiments to determine the influence of alum upon the digestibility of gluten. He reaches the following conclusions :—

1. Gluten, after treatment with alum, or insoluble salts of alumina, is less soluble than ordinary gluten in the gastric juice, by about one-half. Whether the alumina is in a soluble or an insoluble form seems to have no great influence in its effects upon the gluten.

2. Bread made with yeast was one-third more soluble in gastric juice than bread made with an alum baking powder.

3. Alum has a very marked influence upon the conversion of starch by diastase.

4. This powerful action of mere traces of alum or salts of alumina upon soluble gluten and diastase is, I think, sufficient foundation upon which to assert that alum either in a soluble form or mixed with carbonate of soda, is injurious to health when introduced into bread ; the extent of the injury may or may not be small.

H. A. Mott (*Journal of the American Chemical Society*, vol. II) describes experiments made upon dogs fed with biscuits prepared from alum baking powder. Sickness and vomiting, followed by constipation were well marked in each case, where five dogs were experimented upon. Three dogs fed with biscuits made with the same amounts of cream tartar powder, "ate well and were not in any way affected."

Hydrate and phosphate of alumina were mixed with meat, and finally burnt alum with meat. In every case sickness, trembling and loss of appetite resulted, and the meat was vomited in an undigested condition. Gastric juice from healthy dogs was used in the digestion of fibrin and albumen (white of an egg, boiled). These dissolved completely, but on repeating the experiment after addition of hydrate of alumina and phosphate of alumina, digestion was either very much delayed or entirely prevented.

Dr. Charles F. Chandler, of Columbia College, in the case of Mott *vs.* Burns, speaks thus (*See The Analyst*, vol. VI., p. 91) :—'There is an injurious constituent left after the mixture of alum and bicarbonate of soda in a baking powder. I think it is dangerous to the digestive organs and liable to produce serious disturbance of the liver of the individual making use of such powders.'

Henry Morton, president of Stevens Institute, testified, in the same case :—'I took a portion of this (alum) powder and mixed it with flour in the directed proportions, and baked a small loaf with it, then I soaked this loaf in cold water and made an extract in which I readily detected alumina in a soluble condition.'

Dr. S. W. Johnson, professor of Chemistry, at Yale, and Prof. Raymond, of Brooklyn, testified to the harmful character of alum baking-powders.

Otto Hehner (*Analyst*, vol. XVII., p. 201) publishes a long series of experiments upon the influence of alum and the residues of an alum baking powder on digestion. A solution of pepsin was used, and experiments were made with egg albumen, wheat flour, milk and bread.

In the case of egg albumen Mr. Hehner finds that 'alumed baking powder is quite as injurious as alum itself.'

In the case of digestion of flour 'alum has a most injurious influence, while the influence of alumed baking powder is slight.'

In bread, he concludes, 'with small amounts the influence of alum and of alumed baking powder is equal, but with larger quantities the alum acts more detrimentally than does the baking powder.'

In the case of milk 'the alumed baking powder exerts a more injurious influence than does the amount of alum contained in it.'

Mr. Hehner made physiological tests on himself and three assistants, and states his conclusions as follows :—

'Alum baking powder exerts a most injurious influence upon digestion, whether artificial or within the body ; the presence of alum in baking powder must be regarded as an adulteration injurious to health. The sodium bicarbonate contained in the powder does not neutralize the objectionable qualities of the alum.'

W. D. Bigelow and C. C. Hamilton (*Journal American Chem. Soc.* xvi, 587-597) have published a long series of experiments upon the double digestion of the gastric and pancreatic ferments. They conclude :—

1. That the influence of alumed flour on the digestion is over-estimated, since the albuminoids not digested by the pepsin are almost all digested by the alkaline pancreatic solution.
2. That the influence of aluminum hydroxide on digestion is about the same as that of an equivalent quantity of alum. The action of the phosphate is quite different, for in spite of frequent statements as to its insolubility, the preceding results show that from 10 to 12 per cent of the albuminoids which are digestible in presence of aluminum hydroxide and alum, are insoluble in the presence of an equivalent quantity of aluminum phosphate.

Prof. Mallet of the University of Virginia has made an extended series of digestion experiments, the results of which are published in the *Chemical News*, 1888. His conclusions are summarized as follows :—

(*a.*) The greater part of the alum baking powders in the American market are made with alum, the acid phosphate of calcium, bicarbonate of sodium and starch.

(*b.*) These powders, as found in retail trade, give off very different proportions of carbonic acid gas, and therefore require to be used in different proportion with the same quantity of flour, some of the inferior powders in largely increased amounts to produce the requisite porosity in bread.

(c.) In these powders there is generally present an excess of the alkaline ingredient, but this excess varies in amount, and there is some times found on the contrary an excess of acid material.

(d.) On moistening with water, these powders, even when containing an excess of alkaline material, yield small quantities of aluminum and calcium in a soluble condition.

(e.) As a consequence of the common employment of calcium acid phosphate along with alum in the manufacture of baking powders these, after use in bread-making, leave at any rate most of their aluminum in the form of phosphate. When alum alone is used the phosphate is replaced by hydroxide.

(f.) The temperature to which the interior of bread is exposed in baking does not exceed 212° F.

(g.) At the temperature of 212° F. neither the 'water of combination' of aluminum hydroxide nor the whole of the associated water of either this or the phosphate is removed in baking bread containing these substances as residues from baking powder.

(h.) In doses not very greatly exceeding such quantities as may be derived from bread as commonly used aluminum hydroxide and phosphate produce, or produced in experiments upon myself, an inhibitory effect upon gastric digestion.

(i.) This effect is probably a consequence of the fact that a part of the aluminum unites with the acid of the gastric juice and is taken up into solution, while at the same time the remainder of the aluminum hydroxide or phosphate throws down in insoluble form the organic substance constituting the peptic ferment.

(k.) Partial precipitation in insoluble form of some of the organic matter of food may probably also be brought about by the presence of the aluminum compounds in question.

(l.) From the general nature of the results obtained the conclusion may fairly be deduced that, not only alum itself, but the residues which its use in baking-powder leaves in bread, cannot be viewed as harmless, but must be ranked as objectionable, and should be avoided when the object aimed at is the production of wholesome bread.

Finally, I may quote the conclusions of C. A. Crampton, Assistant Chemist to the Department of Agriculture at Washington. (*See* Bull. 13, 1889.)

(1.) That form of alum powder in which sufficient phosphate is added to combine with all the aluminium present, is a better form, and less apt to bring alum into the system than where alum alone is used.

(2.) It must be expected that small quantities, at least, of alum will be absorbed by the digestive fluids, when any form of powder containing it is used.

(3.) Whether the absorption of small quantities of alum into the human system would be productive of serious effects, is still an open question, and one that careful physiological experiment alone can decide.

In regard to the first of Mr. Crampton's conclusions I may remark, that it is evidently based on the assumption that phosphate of alumina is harmless. This, however, cannot be accepted as a proven fact. On the contrary, the experiments of Bigelow and Hamilton, of H. A. Mott and others, show phosphate of alumina to be quite as dangerous as the hydrate, or even alum itself.

I have made experiments to determine whether aluminium hydrate would react with soluble phosphates under the conditions of normal gastric digestion. I have proved that when pure hydrate of alumina is shaken for some time with a neutral solution of phosphate of soda, the insoluble alumina can be washed nearly free from phosphoric acid; but if the solution of phosphate of soda be acidified with hydrochloric acid to the extent of 0·2 per cent (i.e. to the acidity of gastric juice), a residue remains which cannot be washed free from phosphoric acid, showing that phosphate of alumina has been formed, and proving the solubility of precipitated alumina in the gastric juice. A saturated solution of calcium phosphate in 0·1 per cent hydrochloric acid gave a like result. This result is corroborative of the work of other experimenters; and its importance lies in that it demonstrates the fact of the removal of soluble phosphates from the food, and thus produces phosphorous starvation in the animal economy. So that if we overlook the possible presence of unchanged alum, in the residues from use of an alum powder, and suppose hydrate of alumina alone to be found as the result of its

decomposition, we are yet forced to grant the harmful tendency of this residue since the acidity of the gastric juice is sufficient to determine its reaction with the phosphates of our food.

Both hydrate of alumina and phosphate of alumina are gelatinous, viscid precipitates and the former is often used as a means of entangling and throwing down as so-called 'lakes,' the organic matters which give colour to wines, syrups, etc. The same property of alumina causes it to be used in clarifying water which, like that of the Ottawa River, contains much organic matter in solution and suspension. This mechanical action of the hydrate of alumina is not to be overlooked as among its objectionable features. The soluble matter contained by the stomach after eating is eminently such an emulsion as would be affected by hydrate of alumina, and it is inevitable that nutritious matter and the peptic ferments should be entangled and precipitated by the pulpy hydrate.

'*Burnt alum*' of commerce has a very indefinite composition. Crystallized ammonia alum contains 47·67 p.c. of water, potash alum contains 45·57 p.c., and sulphate of alumina contains 48·66 p.c. The operation of 'burning' is intended to drive off the whole or a portion of this water in either of the above named salts, although in strictness only the first two are alums. In practice it is difficult, if not impossible, to dehydrate the alum without causing a loss of more or less of the sulphuric acid which is combined with alumina. Local super-heating is unavoidable, and the result is that some lumps are more fully burnt than others. A sample of so-called *Anhydrous* alum, which nevertheless retained more than half of its water of crystallization, was used in the following experiments :—

	Acidity per 100 grammes	SO_3	Al_2O_3
	c. c.	p. c.	p. c.
1st lump	736	35·95	12·39
2nd "	886	41·80	13·70
3rd "	708		
4th "	722		
Mean	763	38·88	13·10

These results show how very unequally the different lumps had been affected in the kiln. And although less than half of the water had been driven off, a distinct loss of sulphuric acid had occurred. An average sample of the alum gave 25·72 per cent potassium sulphate, and a calculation based upon the potash contained in it, shews it to have been a potash alum, burnt to a loss of 28·6 per cent of weight, of which loss 23·7 is water and 4·9 sulphuric acid. Some further studies in the effect of burning ammonia and potash alums, and sulphate of alumina are given in Table V., and I think that the want of definiteness in the reaction between burnt alum and soda is a weighty argument against the use of burnt alum in baking powders.

Many of the alum and phosphate powders (*see* Table IV) are effectively alum powders, since the alumina is in excess of that required to combine with the phosphoric acid present. P_2O_5 and Al_2O_3 combine in the ratio 71 : 51 by weight, or, in round numbers the alumina requires one and four-tenths ($1\frac{4}{10}$) its weight of phosphoric acid to convert it into phosphate. A study of Table IV., shews that of the 32 brands there recorded, five brands, viz. :—Crystal, Choice Crystal, Dairy Cream, Dominion and Regal, are essentially alum powders, since the alumina is in excess of the phosphoric acid, and the acidity of the powder is almost entirely due to the sulphuric acid it contains. Of the remaining 27 brands, eighteen (18) viz. :—Barton's, Blue Ribbon, Cook's Choice, Cook's Delight, Cook's Favorite, Daisy, Eagle, Forest City, Golden Crown, Jersey Cream, Lily White, On Top, Paradise, Purity, Smith's Cream, West End, White Star

and Windsor, contain sufficient phosphoric acid to convert theoretically all the alumina into phosphate. Did such conversion into phosphate take place, it would render the alumina insoluble, and incapable of affecting soluble phosphates in food, and in the opinion of C. A. Crampton (see p. 17), would make these powders safer in use than others of their class. The experiments of Bigelow and Hamilton, however, go to prove that phosphate of alumina is quite as objectionable as other alumina compounds, being as effective, or even more so, in rendering albuminoids indigestible, so that these powders cannot be regarded as certainly less dangerous to health than are the straight alum powders.

The considerable proportion of acid phosphate of lime added to the brands just named, may have been so added for the purpose of ensuring the conversion of all the alumina into phosphate, in accordance with Mr. Crampton's suggestion. It is more likely, however, that acid phosphate is added in order to have a quick acting acid in the powder. Superphosphate of lime is much more soluble than burnt alum, and ensures a quicker production of gas. Indeed, it is the extreme solubility of superhosphate of lime which makes it unsatisfactory when used with bicarbonate of soda alone. The whole of the soda is apt to be decomposed before the bread is baked sufficiently hard to remain porous, and it collapses before the hardening stage. If this difficulty with acid (or super) phosphate could be overcome the article would certainly answer the purpose of a wholesome substitute for cream of tartar. As a partial substitute for the latter it is sometimes used, but no sample of baking powder has come into the hands of our collectors, where superphosphate has been used without alum. One Canadian manufacturer has given me a sample of such a powder which he has made for some years past. It was found to have the following composition :—

Maize starch	40·0	per cent.
Cream of tartar	25·6	"
Bicarbonate of soda	24·5	"
Acid phosphate of lime, &c., by difference	9·9	"
	100·0	
Available gas	12·02	per cent.
Residual	0·80	"
Total	12·82	

It is evident that this powder is both efficient and wholesome. I cannot speak of its keeping qualities.

I have also examined samples of acid phosphate of lime as prepared for baking powder manufacture. The available acidity of these samples is given in Table V, Nos. 20 to 25. Mixtures with indicated proportions of bicarbonate of soda, did not possess good keeping qualities : the loss of gas-producing power amounting to over 25 per cent in 20 days. I have no doubt that the difficulties attending the use of acid phosphates will ultimately be overcome by changes in the method of manufacture, or by the use of other than the calcium phosphates. So far as their physiological qualities are concerned, no objection can be found to them.

The efficiency of a baking powder depends upon (1) the volume of gas which it produces, (2) the rate of evolution of the gas. For evident reasons the last named condition is as important to the production of light and spongy bread as the first. It might be inferred that the rate of decomposition of bicarbonate of soda in solution would be entirely determined by the solubility of the acid substance made to react with it, but the following experiments show this not to be the case, at least, so far as decomposition in the cold is concerned. Bicarbonate of soda (0·5 gramme, dissolved in 50 cc. water) was made to react with a slight excess of the acid component, presented to it in powder as a dry cartridge and shaken into solution during one minute. Suitable arrangements for adjusting pressure and temperature were provided, and the evolved gas

collected over water saturated with CO_2. Theoretically, 143 cc. of gas should have been obtained, if the bicarbonate had been completely decomposed. The mean results of many tests gave :—

With crystallized ammon. alum.	102 cc.
" tartaric acid	94 "
" leached acid phosphate of lime	70 "
" partially burnt alum	63 "
" cream of tartar	49 "

The relative solubilities of the substances named are in the following order :—

100 parts water at 20° C, dissolve.	
Tartaric acid	100 parts.
Ammonia alum	13·7 "
Burnt alum	6·6 "
Acid phosphate lime	4·0 "
Cream tartar	0·5 "

The most notable exception is the case of tartaric acid, which although seven times as soluble as alum, was less prompt in effecting the decomposition of bicarbonate of soda. But while crystallized alum is very prompt to react with bicarbonate of soda, partially dehydrated alum is very much slower in its reaction, and, by inference, well burnt alum might be expected to approach cream of tartar in this regard. It is this slowness to react with bicarbonate of soda in the cold which gives to cream of tartar, and to burnt alum, their value as components of baking powder from the point of view of efficiency. Tartaric acid reacts too quickly, and acid phosphate of lime resembles it in this respect.

It will be seen, by reference to table V, that a maximum gas-producing power exists for every combination of bicarbonate of soda with an acid substance like cream of tartar, alum, &c.

The calculated percentage numbers given in the table are based upon the production of a neutral residue in the bread, *i.e.*, the whole of the carbonate of soda is supposed to be decomposed and the soda to remain in combination with tartaric or other acid, as the case may be. It will be seen that the highest gas-producing power which can be given to such a mixture of bicarbonate of soda with cream of tartar is 16·2 per cent by weight, and this assumes the cream of tartar to be chemically pure bi-tartrate of potash. The ordinary cream of tartar of commerce contains more or less tartrate of lime, as well as traces of sulphate, both of which substances reduce its value as a component of baking powder. In the case of such a mixture as above suggested, the proportions of cream of tartar and bicarbonate of soda are 69 and 31 ; or, approximately, 2 to 1. This is the proportion in which cooks generally use these materials, and when they are mixed for immediate use, very good results may be expected. But in order that the mixture may possess keeping qualities, experience has shown that it is necessary to mix in some neutral substance, like starch or flour, known as a *filler*, and from 15 to 20 per cent—preferably the last named percentage—has been found effective. The introduction of such a filler necessitates the lowering of the gas-producing power of the mixture, and the table shows that with 19·7 per cent of starch the maximum gas-producing power of a genuine cream of tartar powder is 13 per cent, and the possession of such a high strength as this necessitates the use of a chemically pure bi-tartrate of potash by the manufacturer.

An examination of Table II will show that the only entirely cream of tartar powders which come up to this standard are Cleveland's Superior, containing 18 per cent of starch (mean of two samples), and the Royal Baking Powder, containing 18·2 and 18·5 per cent of starch (two samples). In Dearborn's Perfect (one sample) the standard is reached by reducing the starch to 15 per cent ; in Kennedy's (one sample)

by reducing the starch to 6 per cent, and in Strong's (one sample) by reducing the starch to 7·4 per cent. These are all excellent powders, and the only injury that can result from a reduction of the starch percentage is a *pari-passu* reduction of the keeping qualities. It will be further seen from Table V that a very much larger gas production can be secured by the use of free tartaric acid. Indeed, the strength of 13 per cent gas can be reached by a tartaric acid powder containing as much as 53·2 per cent of starch. It follows, that by a judicious admixture of free tartaric acid with cream of tartar, a genuine tartar powder may be made to have a much higher leavening power than if made with cream of tartar only. Powders of this type (see Table II) are Cream, Maple Leaf, Price's Cream and Pure Gold. From the point of view of efficiency and wholesomeness, a mixed cream of tartar and free tartaric acid powder doubtless reaches the highest perfection attainable. Whether a mixture containing a still higher proportion of free tartaric acid, and consequently, a higher gas-producing power, than any of those named, could not be made consistently with good keeping qualities, I cannot say. It may be that in these powders the highest practical efficiency has been reached; but I am inclined to think that, by taking especial care to use dry materials, the gas producing power could be still further increased without injury to the keeping quality. Since, however, the cream of tartar powder has been longer in use than any other, its maximum strength (13 per cent of gas) forms a sort of standard which has been accepted by cooks: and the manufacturers of powders who use other materials than cream of tartar find it best not to depart too far from this standard.

Again referring to Table V, we see that the gas yield of burnt alum is a very variable quantity (Nos. 3 to 19, and No. 27) but always much higher than that of cream of tartar, and sometimes even exceeding that of tartaric acid. In consequence of this fact it is easy to make a high grade of alum powder, which yet consists very largely of starch. Reference to Table III will show that most of the alum powders contain from 25 to 50 per cent of starch. Some of them have a very high efficiency, notably Nos. 18 and 19, while in others the total gas-producing power is much higher than that available under ordinary conditions of dough-making. As a rule these powders contain a large excess of soda, see Nos. 3, 5, 12, 30, &c., but, of course, the amount of this excess of soda which remains as carbonate in the bread will to some extent depend upon the conditions under which the baking is done.

The amount of sulphuric acid (SO_3) found in these powders varies from about 8 to as high as 20 per cent, and although, in a general way the efficiency varies as the percentage of sulphuric acid, this is not invariably true. The reason is that only such portion of the acid as is combined with alumina is available for decomposition of bicarbonate of soda. Some of the samples of burnt alum of commerce (see No. 12 and 14 in Table V) seem to be little else than dehydrated sulphate of alumina; and ammonia alum may be so burnt as to leave little else than sulphate of alumina, since the ammonium salt is wholly volatile. When potash alum is burnt, of course the sulphate of potash remains as such, and the acid contained in it is not available in liberating carbonic acid gas. Taking number 12 as an example of an average commercial burnt alum we see that a baking powder, having 13 per cent of gas-producing efficiency, could be made from it by admixture of 54·4 per cent of starch. Such a powder would contain only 20·7 per cent of the burnt alum, representing 13·2 per cent of sulphuric acid. With a burnt alum of still higher acidity, e. g., Nos. 5 or 19, a still lower percentage would be needed. But, it is to be noted that these acidity determinations are based upon titration with soda in hot water solution, and are no doubt considerably in excess of the practicable acidity of the same samples, under the conditions of dough making and baking. It will be seen, however, by reference to table III, that wherever the sulphuric acid content of an alum powder is markedly below 13 per cent, the gas-producing power of the powder is correspondingly reduced. A higher percentage of SO_3 is not necessarily attended with an increase in the efficiency of the powder for reasons already given.

Acid phosphate of lime as prepared for baking powder manufacture, has an acidity not greatly differing from that of cream of tartar (See Nos. 20 to 25 in Table V.) the natural acidity of the salt being reduced by addition of starch, or by the sulphate of lime produced as a by-product in the manufacture of the article. I have already

spoken of the desirability of this substance as a component of baking powder. It is, unfortunately, found to be unavailable for the same reasons that make free tartaric acid unavailable. It is too soluble, and reacts too quickly, in the cold, with the bicarbonate of soda. It is, however, quite possible to use it, as tartaric acid is used, partly to replace the cream of tartar, and I have already referred to one sample furnished by a maker of such a baking powder. This powder does not seem however, to be widely known, and no samples of it came into the hands of our food inspectors. The acid phosphate of lime is very largely used along with burnt alum, in order to furnish a quick-reacting ingredient of these powders; and it is the source of the phosphoric acid in the powders, (83 samples) enumerated in Table IV. In admixture with cream of tartar I do not know that any exception, on the ground of wholesomeness, could be taken against phosphate of lime. It is quite otherwise in admixture with alum. In this case the phosphoric acid probably remains in the bread combined with alumina, and not with soda; and the insoluble phosphate of alumina, as already shown, has a distinctly harmful effect upon digestion. Of the 83 samples in Table IV, eleven contain less than 3 per cent of phosphoric acid—most of these less than 2 per cent—and they are to be regarded as alum powders, in effect. In the others, the alum is still the effective acid agent, except at the commencement of reaction. These powders, in few cases only, come up to the efficiency of tartar powders, and their average efficiency is below that of the straight alum powders.

	Baking Powders.		
	Tartar.	Alum.	Alum Phosphate.
Average efficiency	11·7	10·3	8·7
Maximum efficiency	15·6	18·3	12·4

With regard to the keeping qualities of the baking powders examined, it is sufficient to say that the cream of tartar powders, as a rule, keep well with about 20 per cent of starch. When free tartaric acid, in not too large proportion, is present, the result shows good keeping qualities, with from 20 to 30 per cent of starch. Where tartaric acid in the free state, is the main acid ingredient, of course a high percentage of starch is possible—see Nos. 24 to 26, and 49 and 50—and this seems to answer its purpose very well. Alum powders naturally keep well, the difficult solubility of the burnt alum and the large amount of starch both being favourable to this end. The alum phosphate powders show more marked deterioration from keeping; e.g. Nos. 9, 10, 39, 70, 71. The last two are exceptional, as containing tartaric acid equivalent to about 12 per cent of cream of tartar.

The following notes on methods of working may prove useful to analytical chemists who are called upon to deal with baking powders.

Starch.—The direct estimation of the starch by the use of solvents for the other constituents of the powder, and the weighing of the starch on a tarred filter, as described more fully in note to Table II, is much more expeditious than the method by conversion to sugar and the use of Fehling solution, and is equally trustworthy and accurate. Where a residue of alumina or basic sulphates of alumina remains with the starch, a correction can easily be applied.

Organic Acids.—In cream of tartar and tartaric acid powders the estimation is easy, and may be made either by burning the carefully neutralized powder and titrating the resulting carbonates, or by precipitating the (concentrated) solution from starch estimation, with potassium acetate and acetic acid and addition of alcohol. I find the first named method to be more satisfactory and trustworthy, although if proper care as

to details is taken, the results by the precipitation method may be very good. The mechanical shaker can be used to advantage in bringing about the separation of the bi-tartrate of potash.

The estimation of tartaric acid in mixtures of tartrates with burnt alum and phosphates of lime, is by no means an easy one. The amount of error, when the ignition method is used, may reach 6 per cent (calculated to bi-tartrate of potash) when burnt alum is present, and may be nearly twice as large with acid phosphate of lime. These are the extremes found in actual examination of mixtures of known composition; the error is usually about 3 to 4 per cent. See Bull. 26, p. 20. The difficulty lies in exactly neutralizing the burnt alum and in bringing about a definite combination in the case of the phosphate. The question of neutralizing alum has already been discussed. (See p. 12, *ante*.) Neither Rosolic acid nor cochineal are satisfactory indicators with orthophosphoric acid. Phenolphthalein is the only indicator which works with any certainty, so far as I know. To this indicator, di-sodium hydrogen phosphate is neutral in cold solution; in hot solution, however, the mono-sodium phosphate reacts neutrally: but free acid is developed as the solution cools, when the di-sodium salt is found in solution. If, however, calcium sulphate is present, as in straight phosphate (see Nos. 20 and 21 in Table V), acidity continues to be developed on boiling, and if soda is added to neutralize this, a neutral phosphate is formed which does not decompose on cooling the solution. Further investigation of this reaction is required, and I have a series of experiments in progress, which, I hope, will explain it. I mention the reaction in this connection as throwing light upon the very irregular results obtained with mixtures of tartrates and phosphates.

The only accurate way of getting at the tartaric acid in phosphate powders is by precipitating the acid in combination with potash as bi-tartrate. Only one brand of the alum phosphate powders collected on the market gave more than a trace of tartaric acid. (See Nos. 70 and 71 in Table IV.)

Alumina.—This estimation presents no difficulties in the case of straight alum powders. The alumina which results from over-burning the alum is often so difficultly soluble in dilute hydrochloric acid that as much as 1 to 1·5 p. c. of Al_2O_3 may be found in the starch. Occasionally, but rarely, a trace of sulphuric acid remains undissolved, being combined as basic sulphate of alumina. In alum phosphate powders the estimation of alumina is much more tedious. In 1888 I worked out a method, which was published in Bull. 25 (see p. 23 et seq.), which consisted essentially in adding a known excess of phosphoric acid and throwing down the normal phosphate of alumina in acetic acid solution, subsequently estimating residual phosphoric acid with uranium solution. The method was not recommended so much on the ground of extreme accuracy as on account of its expeditiousness, combined with such a degree of accuracy as made it satisfactory for this kind of work. I have caused the method to be examined independently by Mr. Connor, of this city, and I subjoin his report upon it, as well as parallel determinations in certain baking powder samples, where the method of adding a known amount of ferric oxide, throwing out all of the phosphoric acid and alumina, with ammonia, and determining the phosphoric acid in another portion of the sample by molybdate, has been used to check the acetic acid method.

Mr. Connor writes as follows:—'I herewith desire to report the results of my examination of the uranium method, as described in Bulletin 26, I. R. Dept., for determination of alumina and phosphoric acid in baking powder materials.

Briefly the uranium method consists in precipitating the alumina wholly as phosphate, in acetic acid solution, by adding an excess of a standard phosphate solution previous to precipitation and weighing the precipitate for the alumina estimation. The excess of phosphate carried into the filtrate is estimated by titration with uranium solution, the phosphoric acid in the sample being got at by subtracting the amount added from the total phosphoric acid contained in the precipitate (calculated) and in the filtrate by titration.

The results of my examination of the above method are:—

1. As to the best method of using the potassium ferrocyanide for the detection of excess of uranium solution. The powdered crystals placed on porcelain gave very satisfactory results, and are preferable to a solution of ferrocyanide.

In four solutions, each containing fifty cc. of a microcosmic salt solution, I treated with uranium solution, and obtained results as follows :—

		Ferrocyanide.	
		Crystals.	Solution.
		cc.	cc.
(a) Containing 5 c.c. sod. acetate		20·1	20·1
(b) " 10 "		20·1	No colour at 20·1
(c) " 15 "		20·1	20·6
(d) "	5 "	20·1	20·7
	10 HCl., neutralized by ammonia	..	.....

(2) As to the separation of the alumina phosphate from the lime contained in the baking powder solution :—

If this separation is not made correctly lime phosphate may be weighed along with the alumina phosphate, giving it a false value. I found that at boiling temperature, the acetic solution would separate phosphate of lime along with alumina phosphate ; but if the temperature of the solution is kept at about 80°C. for about ten minutes the lime is very largely prevented from co-precipitation. I worked as follows :—

To fifty cc. of the dilute hydrochloric acid solution of the baking powder (representing one gramme of the sample) I added five cc. of sodium acetate solution (1 : 10), made the solution alkaline to litmus paper, acidified with 1 cc. glacial acetic acid and stirred. The solution was then heated on the sand bath to 80° C. for ten minutes, allowed to settle, filtered and washed with hot water. 75 cc. of wash water will carry all excess of phosphate into the filtrate, which is then heated and titrated. The precipitates are washed further, till free from chlorides, ignited and weighed, neglecting, of course, to save the additional filtrates.

As a check upon the results obtained by the above method, I used, for determination of phosphoric acid its separation by ammonium molybdate (as is shown under my remarks on method of checking alumina results), titration of the ammonium molybdate, with standard caustic potash, and titrating back the excess of potash with standard nitric acid, a method for phosphoric acid which gives everything that could be desired as to accuracy and speed.

For the determination of alumina I added an excess of a standard solution of ferric chloride to the hydrochloric acid solution of the sample, and precipitated together all the iron, alumina and phosphoric acid in the solution, free from lime. I operated as follows :—The hydrochloric acid solution of the baking powder, after the addition of sufficient ferric chloride to colour the precipitate brown (5-10 cc. of a solution containing 0·1732 ferric oxide in 10 cc. was found sufficient) is made alkaline to litmus paper, in the cold, with ammonia, and then three to four drops, in excess of acetic acid are added, boiled three minutes, let settle, filtered and washed with hot water, ignite and weigh the precipitate—total P_2O_5, Al_2O_3, Fe_2O_3. The Fe_2O_3 being known, the sum of P_2O_5 and Al_2O_3 is also known. After weighing, this precipitate is dissolved in 5 cc. strong HCl by boiling for about ten minutes ; 25 cc. HNO_3 are then added, and the boiling continued till nitrous fumes disappear. This solution is then treated for phosphoric acid as described above.

The following conclusions seem to be justified :—

1. The Uranium method must be worked carefully, with the precautions noted, or the result cannot be reliable.

2. The titration of excess of P_2O_5 has to be done slowly and with care.

3. The phosphoric acid determination by the molybdate check method is quickly performed (using asbestos for filtering) and the titration is very simple, using phenolphthalein.

4. As to the alumina determination by the iron method, the addition of excess of ferric chloride makes a bulky precipitate, which, however, is easily washed (using boiling water), and requires less time than the corresponding precipitation and washing by the uranium method.

The following tabulation of results by both methods shews how they have worked in my hands :—

Samples of Baking Powder.	P_2O_5.		Al_2O_3.	
	Uranium Method.	Iron Method.	Uranium Method.	Iron Method.
Sample (*a*)	1·26	1·33	4·38	3·75
" (*b*)	5·27	5·25	3·30	4·04
" (*c*)	4·74	4·63	3·10	3·53
" (*d*)	4·60	4·82	2·05	1·96
Mean	3·97	4·01	3·21	3·32

I may add to the above the following results obtained by Mr. Connor by the iron method, and by Miss Tyrrell, of this laboratory, with the uranium method :—

Samples of Baking Powder.	P_2O_5.		Al_2O_3.	
	Uranium Method.	Iron Method.	Uranium Method.	Iron Method.
Sample (*f*)	1·91	2·08	3·69	2·94
" (*g*)	5·28	4·80	4·32	4·90
" (*g*)	4·91	4·97	3·65	3·10
Mean	4·02	3·95	3·89	3·65

It will be seen that the differences are sometimes of excess, and sometimes of deficiency, so that, in a series of determinations they nearly balance each other. I am inclined to agree with Mr Connor that, taking everything into consideration, the iron method is to be recommended in preference to the uranium method : although, with due care on the part of the analyst, the latter may give sufficiently good results, and, for a long series of determinations, has the advantage of requiring less time.

One other point strikes me, namely : the fact that the presence of traces of phosphate of lime in the precipitate of phosphate of alumina, would affect the accuracy of the alumina estimation very much more than that of phosphoric acid, since the molecular weights of $Ca_3 (PO_4)_2$ and $Al_2 (PO_4)_2$ are as 310 : 244 ; while the apparent alumina would be increased by the total weight of lime in the precipitate. It is noteworthy that the mean Al_2O_3 by uranium is 3·50, while that by iron is 3·46 ; which goes far to demonstrate the very slight source of error from imperfect separation of lime.

Ammonia alum seems to be much less used than formerly in the alum powders. In 1888 I found most of the alum to contain ammonia. In this examination 33 samples have been examined for ammonia, and only two of these gave any considerable amounts of it. Both were straight alum powders, and gave results as follows :—

Sample 19,592 (*b.*) ..... 6·07 ammonia sulphate.
" 19,566 (*b.*) ..... 7·52 " "

Five other samples gave traces of ammonia.

The low percentage of sulphuric acid present in many of these powders, together with the fact that recently, imported samples of burnt alum containing only traces of alkali have come under my notice, leads me to infer that burnt sulphate of alumina is taking the place of burnt alum properly so called, This gives a higher efficiency to the article, and no objection holds against its use as compared with alum, provided the pure sulphate is employed by the roaster. Separation from mother-liquors as alum crystals ensured the purity of the raw material in a way which the use of the difficultly crystallizable sulphate of alumina can scarcely be said to do.

I have the honour to be, sir,

Your obedient servant,

A. McGILL.

TABLE II.—BAKING POWDERS consisting essentially of Cream of Tartar, Tartaric Acid, Bi-carbonate of Soda, and Starch.

Serial Number.	Department Serial Number of Letter.	Name.	Starch.—See Note 1.	Carbonic Acid Gas. Available. See Note 2.	Carbonic Acid Gas. Total. See Note 3.	Cream of Tartar. See Note 4.	Bi-carbonate of Soda. See Note 5. Approximate by difference.	Bi-carbonate of Soda. See Note 5. Available from CO_2.	Excess of bi-carbonate soda.—See Note 4.	Bi-carbonate soda calculated from total CO_2. See Note 5.	Remarks. See Note 6.	Analyst.
1	18468*a*	Cleveland's Superior	...	...	...	55·27	... ...	...	...	...	Maize starch, and a little wheat. A good powder, and apparently keeps well.	Valade.
2	18468*b*		18·2	12·6	13·6	... ...	... ...	24·1	...	26·0		M.
3	\		17·1	13·3	14·3	56·02	26·28	25·4	1·2	27·3		M.
		Means ...	17·7	13·0	14·0	55·64	26·28	24·7	1·2	26·6		
4	18465*a*	Cook's Friend.	32·2	8·2	8·9	.....	... ...	15·6		17·0	Contains rice flour as filling. The first four samples appear to have been injured by keeping.	Valade.
5	18465*b*		30·2	10·4	10·7	46·06	23·74	19·9	0·4	20·5		M.
6	19594*a*		35·1	9·4	.	41·40	23·50	17·9	..	..		Fiset.
7	19594*b*		35·5	9·2	9·5	42·11	22·39	17·6	0·0	18·1		M.
8	B		30·0	12·8	14·1	46·62	23·38	24·4	0·7	26·9		M.
		Means	32·6	10·0	10·8	44·05	23·26	19·1	0·4	20·6		
9	17676*a*	Cream ...	30·3	10·3	10·8	45·39	24·31	19·6	..	20·6	Maize starch. Contains part of the tartaric acid in free state. The first sample has deteriorated. A good powder.	Bowman.
10	17676*b*		28·1	13·3	14·3	46·81	25·09	25·2	1·9	27·3		M.
11	I		28·8	13·3	14·9	.....	.....	25·2	..	28·4		M.
		Means	29·1	12·3	13·3	46·10	24·70	23·3	1·9	25·5		
12	17674*a*	Dearborn's "Perfect"	15·6	10·3	12·0	52·64	31·76	19·6	...	22·9	Contains maize starch. The first sample shows deterioration by keeping. Contains a decided excess of bi-carbonate soda. Is a good powder.	Bowman.
13	17674*b*		...	13·3	.	...	... ...	25·4	...	...		M.
14	17681*a*		14·7	11·0	14·8	... ...	... ...	20·9	...	28·2		Bowman.
15	17681*b*		15·1	10·8	14·3	57·15	27·75	20·8	3·7	27·3		M.
		Means	15·1	11·3	13·7	54·90	29·75	21·7	3·7	26·1		
16	16737*a*	Fairy.	19·2	11·0	12·5	49·78	31·02	21·0	..	23·9	Maize starch. A good powder.	Bowman.
17	16737*b*		22·0	12·6	13·8	54·52	23·48	24·1	2·7	26·4		M.
		Means	20·6	11·8	13·1	52·15	26·25	22·5	2·7	25·1		

18	19564*a*	Imperial	.....	.....	....	.....	.....	...	...	...	Maize starch. The samples examined appear to have been injured by keeping. A slight deficiency of soda.	Edwards.
19	19564*b*		17·8	9·8	....	57·15	25·05	18·7	0·0	..		M.
20	C		17·8	10·0	10·8	57·53	24·67	19·1	0·0	20·6		M.
		Means	17·8	9·9	10·8	57·34	24·86	18·9	0·0	20·6		
21	18464*a*	Kennedy's.	16·6	....	..	61·29	22·11	...	.....	...	Maize starch. Contains 1·87 per cent lime (CaO) equivalent to about 12 per cent of calcium tartrate. No. 23 gave only 14·9 per cent CO_2 on analysis six weeks later.	Valade.
22	18464*b*		...	11·7	13·0	.....	..	22·4	4·4	24·8		M.
23	D		6·0	15·6	16·9	63·92	30·08	29·7	3·9	32·2		M.
		Means	11·3	13·6	15·0	62·60	26·10	26·1	4·1	28·5		
						Tartaric acid.						
24	16743*a*	Maple Leaf.	41·3	13·5	15·6	22·3	36·4	25·7	.	29·8	Contains wheat flour as filling. The tartaric acid is chiefly in the free state. Is a very efficient powder, containing a decided excess of bi-carbonate soda.	Bowman.
25	16743*b*		35·9	14·9	.....	28·4	35·7	28·4	4·7	...		M.
26	E		...	14·2	17·1	28·4	.....	27·1	..	32·6		M.
		Means	38·6	14·2	16·3	26·4	36·0	27·1	4·7	31·2		
27	18474*a*	Perfection	8·3	11·6	12·4	62·44	29·26	22·2	.....	23·6	Maize starch. Contains 1·71 per cent CaO = equivalent to 11·1 per cent calcium tartrate.	Ellis.
28	18474*b*		9·0	12·5	13·8	63·17	27·83	22·8	2·5	26·3		M.
		Means	8·7	12·0	13·1	62·80	28·60	23·0	2·5	25·0		
29	17190*a*	Price's Cream	21·2	11·8	13·0	50·50	28·30	22·6	....	24·9	Maize starch. Contains part of the tartaric acid free. An excellent powder.	Kenrick.
30	17190*b*		20·2	14·6	15·6	51·70	28·10	27·8	1·8	29·9		M.
31	F		20·1	14·8	16·0	54·33	25·57	28·3	1·5	30·5		M.
		Means	20·5	13·7	14·9	51·51	27·32	26·2	1·7	28·4		
32	19568*a*	Pure Gold	19·3	....	...	.....	.....	....	..	....	Maize starch. A good powder. A trace of free tartaric acid.	Edwards.
33	19568*b*		21·2	10·4	12·4	54·71	24·09	19·9	1·2	23·7		M.
34	G		20·1	13·9	15·4	55·77	24·13	26·5	0·5	29·4		M.
		Means	20·2	12·2	13·9	55·26	24·11	23·2	0·9	26·6		
35	20152*a*	Regal	20·8	.....	9·7	.....	.....	...	.	18·3	Maize starch. A slight deficiency of soda. Contains 1·3 per cent calcium tartrate.	Fagan.
36	20152*b*		20·3	11·5	11·9	56·96	22·66	21·9	0·2	22·8		M.
37	K		20·2	10·8	11·3	56·40	23·40	20·6	0·2	21·6		M.
		Means	20·4	11·2	11·2	56·68	23·03	21·3	0·2	21·0		
38	16740*a*	Renown	27·5	11·4	12·8	.....	.....	21·7	.....	24·4	Maize starch. A good powder. Contains a trace of free tartaric acid.	Bowman.
39	16740*b*		29·6	12·0	13·7	47·00	23·4	23·0	3·1	26·2		M.
		Means	28·6	11·7	13·3	47·00	23·4	22·4	3·1	25·3		

TABLE II.—BAKING POWDERS consisting essentially of Cream of Tartar, Tartaric Acid, Bi carbonate of Soda, and Starch—*Concluded.*

Serial Number.	Departmental Number of Letter.	Name.	Starch—See Note 1.	Carbonic Acid Gas.		Cream of Tartar. See Note 4.	Bi carbonate of Soda. See Note 5.		Excess of bi carbonate soda. See Note 4.	Bi carbonate soda calculated from total CO_2. See Note 5.	Remarks. Note 6.	Analyst.
				Available. See Note 2	Total See Note 3		Approximate by difference.	Available from CO_2.				
40	16734*a*	Royal	19·2	11·9	12·6	53·58	27·22	22·7	.	24·0	Maize starch. An excellent powder.	Bowman.
41	16734*b*		. . .	13·0	.	. . .	. .	24·8	0·7			M.
42	17675*a*		19·0	11·1	11·8	52·64	28·36	21·2	. .	22·5		Bowman.
43	17675*b*		. . .	12·4	13·2	54·71	. . .	23·7	1·3	25·2		M.
44	18467*a*		. . .	. .	.	52·29	. . .	.	. .	. .		Valade.
45	18467*b*		18·2	13·3	14·1	55·08	26·72	25·4	1·8	27·0		M.
46	19567*a*		19·3	. . . .	.	. . .	. . .	. .	. .	. . .		Edwards.
47	19567*b*		18·4	11·6	13·2	55·08	26·52	22·2	2·0	25·1		M.
48	II		18·5	13·9	15·3	54·71	26·79	26·5	1·7	.		M.
		Means	18·8	12·5	13·4	54·01	27·21	24·5	1·5	26·2		
49	19303*a*	Salvador	47·3	8·8	. . . .	Tartaric acid. 23·3	29·4	16·8	. .	.	Maize starch. Tartaric acid chiefly free. Contains a marked excess of bi carbonate soda.	Harrison.
50	19303*b*		46·9	9·9	12·9	25·1	28·0	18·9	7·5	24·5		M.
		Means	47·1	9·4	12·9	24·2	28·7	17·9	7·5	24·5		
51	19304*a*	Strong's	7·0	12·4	. . . .	64·39	28·61	23·7	. .	. .	Maize starch. Contains 1·98 p.c. lime, equivalent to nearly, 13 p.c. calcium tartrate. No. 52 gave 12·2 p.c. CO_2 after six weeks keeping.	Harrison.
52	19304*b*		7·4	13·1	14·8	61·66	30·24	24·9	3·4	28·3		M.
		Means	7·2	12·7	14·8	63·02	29·82	24·3	3·4	28·3		
53	16735*a*	Woodill's German	33·5	7·7	9·5	33·45	33·05	14·6	. . . .	18·2	Contains wheat flour. Samples much deteriorated by keeping.	Bowman.
54	16735*b*		37·2	9·1	10·7	39·86	22·94	17·3	3·5	20·3		M.
		Means	35·4	8·4	10·1	36·65	28·00	16·0	3·5	19·3		

Notes to Table II.

1. The starch, in these samples, has been determined as follows :—10 grammes are treated with 150 cc. cold water, containing about 5 per cent of strong ammonia solution, and shaken—by machinery—for one hour. The starch is collected on a tared filter, and washed till neutral. The filter and contents are dried in warm air (40° to 50° C.), and then allowed to stand at the ordinary temperature of the laboratory, exposed to air, before weighing, to take up normal moisture. The purity of the starch is ensured by examining it with the microscope. The results are accurate to within one (1) per cent where a purified starch has been employed in manufacture. Where flour has been used, an error of from 3 to 5 per cent is probable.

2. The amount of so-called *available* gas furnished by a baking powder, is to some extent dependent upon the method employed in making this determination. No laboratory method has been devised which can be said to exactly imitate the conditions obtaining in the oven. It is probable that most of our methods indicate a somewhat higher yield than is obtained by the cook. So long, however, as the same mode of operating is maintained throughout a series of tests, the results will be strictly comparable among themselves. My method of working is as follows :—A cartridge of 4 grammes of the sample is introduced into a dry flask of 200 cc. capacity, fitted with a funnel tube reaching nearly to the bottom, and connected with a series of U tubes for drying and absorbing the gas. An aspirator draws carbonic acid free air through the whole apparatus, and measures the volume of this air. 100 cc. cold water is passed into the flask, through the funnel tube, and heat applied to a vessel of water, in which the flask is immersed. This is so arranged as to reach the boiling point in about 10 minutes, and the duration of the test is about 25 minutes during which time 15 litres air are drawn through. A back flow condenser interposed between the flask and the first tube prevents steam from passing over. Soda lime is used to absorb the gas, and the efficiency of the apparatus has been amply established.

A formula for soda lime, which has given special satisfaction, will be found in the Journal Am. Chem. Soc., Vol. xxi., p. 396.

It will be observed that the percentage of gas obtained is, in some cases, considerably higher than corresponds to the available acid of the sample. This is because bi-carbonate of soda gives off part of its gas spontaneously under the conditions of the test. The following experiment will illustrate this. A mixture was made, of pure materials, as follows :

Cream tartar	54·5 p.c.
Bi-carbonate soda	29·0 "
Maize starch	16·5 "
	100·0

This mixture contains 15·2 per cent of CO_2, of which the bi-tartrate of potash should set free 12·7 per cent. Experiment gave 14·05 per cent available.

3. The residue in the flask is treated with dilute sulphuric acid, and the evolved gas is added to the so-called 'available'.

4. Five (5) grammes of the sample is weighed into a beaker of 300 cc. capacity, and 100 cc. water added. When effervescence has subsided, 5 cc. normal sulphuric acid is added, to decompose any excess of carbonate. The solution is boiled to get rid of CO_2, phenolphthalein added, and normal soda to neutralize. The difference between the volume of soda required and that of sulphuric acid added gives data for calculation of excess of bi-carbonate of soda present in the sample above that which combines with the tartaric acid present. (See column 10 of table.) The neutralized solution is evaporated to dryness in platinum, and the residue charred to convert tartrates into carbonates. The charred mass is extracted with hot water, and a definite volume (excess) of normal sulphuric acid—usually 35 cc. is sufficient. The filtrate is boiled to drive off CO_2, and titrated back with normal soda. From the data so obtained the total tartaric acid is calculated. In column 7 of the table this is stated, for the most part, in terms of bi-tartrate of potassium ; in those samples (Maple Leaf and Salvador brands) in which most of the acid is free, it is stated as such. Of course, the presence of any free acid in the sample (Cream and Price's Cream) will cause an apparent increase in the cream of tartar, in the ratio 94:75. The error is not great, however, where only a few units per cent of free acid are present. The tartaric acid present as calcium tartrate, will thus be calculated to cream of tartar, and make the percentage of acid potassium tartrate seem out of proportion to the efficiency of the sample. This is the case with the following brands, viz. :—Kennedy's, Perfection and Strong's, in which a low grade of cream of tartar, containing from 11 to 13 per cent of tartrate of lime has been used. In most of the samples, however, very pure cream of tartar has been used, and only traces of lime are found in any of these samples, other than the three brands named above.

5. Errors in starch and cream of tartar determinations will, of course, enter into the difference numbers given in the first of these columns, so that the figures given are only approximations to the truth. The second column gives bi-carbonate of soda corresponding to the available carbonic acid, as given in column 5. When this differs materially from that given in column 11, it will be found that bi carbonate of soda is considerably in excess of cream of tartar (or tartaric acid) in the sample. This is further corroborated by the figures given in column 10.

6. In conclusion it may be said that none of the samples enumerated in this table can be objected to on the ground of healthfulness. Most of them are excellent powders, and any differences in efficiency are offset, at least to some extent, by differences in cost. Exception might be taken to the excess of soda in some of the samples—e. g. Nos. 15, 22, 23, 36, 49, 51—and particularly to No. 47—but this is a matter of taste on the part of the consumer. Perhaps objection might be taken to the large percentage of lime salts in Nos. 21, 22, 23, 27, 28, 48 and 49. But, although calcium tartrate is a useless component of baking powder, it cannot be said to be dangerous to health.

Most of the samples show good keeping qualities. Where deterioration is indicated I have noted it in column 12.

Table III.—Alum Baking Powders.

Serial Number.	Departmental Number or Letter.	Name.	Starch. See Note 1.	Sulphuric Acid SO_3.	Alumina Al_2O_3—Note 2.	Undetermined.—Note 3.	Carbonic Acid Gas. Note 5.			Bi-carbonate Soda. Note 4.		Remarks.	Analyst.
							Available.	Residual.	Total.	Available.	Total.		
1	18460*a*	Barley Cream	38·8	16·96	6·09	38·15	13·3	1·3	14·6	25·4	27·9	Maize flour. CaO = 0·53 p. c. Contains a trace of ammonia alum = 1·32 p. c. $(NH_4)_2SO_4$	Valade.
2	18460*b*		36·5	16·24	5·00	42·26	13·9	0·6	14·5	26·6	27·8		M.
		Means	37·7	16·60	5·55	40·20	13·6	1·0	14·6	26·0	27·9		
3	18475*a*	Champion	..	13·32	..	..	8·0	4·1	12·1	15·3	23·1	Maize starch	Ellis.
4	18475*b*		50·2	12·33	4·50	32·97	..	..	12·6	..	24·2		M.
		Means	..	12·82	..	..	..	..	12·4	..	23·7		
5	18476*a*	Cook's Best Friend	58·8	9·30	2·35	28·24	7·0	3·6	10·6	13·4	20·3	Samples 18476*a* and *b* contain 1·31 per cent of P_2O_5. Maize starch.	Ellis.
6	18476*b*		52·8	6·83	2·22	38·14	..	..	..	..	..		M.
7	19302*a*		55·3	9·61	3·20	31·89	10·5	..	..	20·1	..		Harrison.
8	19302*b*		56·5	7·76	2·20	33·54	..	..	10·2	..	19·5		M.
		Means	55·8	8·38	2·50	32·95	8·8	..	10·4	16·8	19·9		
9	19573*a*	Cook's Pride	..	..	..	..	8·5	..	..	16·2	..	Sample 19573*b* contains 0·4 p. c. P_2O_5. Maize starch. 19592*b* is made with ammonia alum and yielded ammonia equivalent to 6·07 p. c. $(NH_4)_2SO_4$.	Edwards.
10	19573*b*		48·4	11·20	3·69	36·49	12·0	0·9	12·9	22·9	24·5		M.
11	19592*a*		53·1	16·83	5·90	24·17	8·5	..	..	16·2	..		Fiset.
12	19592*b*		53·0	12·26	4·05	30·69	9·0	3·3	12·3	17·2	23·5		M.
		Means	51·5	13·43	4·55	30·45	9·5	2·1	12·6	18·1	24·0		
13	16741*a*	English Cream	51·3	..	..	..	10·0	0·7	10·7	19·1	20·4	18463*a* and *b* contain, respectively, 1·38 and 1·31 p. c. P_2O_5. Maize starch.	Bowman.
14	16741*b*		48·4	12·41	4·11	35·08	..	..	..	..	..		M.
15	18463*a*		55·8	8·47	..	..	5·8	1·9	7·7	11·1	14·6		Valade.
16	18463*b*		50·6	7·72	3·34	37·03	..	..	11·5	..	22·0		M.
		Means	51·5	9·53	3·73	36·06	7·9	1·3	10·0	15·1	19·0		

17	18466*a*	Fanning's Malt	26·4	.	.	.	.	.	.	.	.	Maize starch	Valade.
18	18466*b*		24·4	20·60	7·05	47·95	18·1	1·7	19·8	34·5	37·8		M.
19	L		25·0	20·20	7·36	46·44	18·3	.	.	35·0	.		M.
		Means	25·3	20·4	7·20	47·20	18·2	.	.	34·8	.		
20	19566*a*	Gem	36·7	.	.	.	6·7	.	.	12·8	.	Maize starch and wheat flour. 19566*b* gave ammonia = 7·52 p. c. $(NH_4)_2SO_4$.	Edwards.
21	19566*b*		35·7	22·9	7·85	33·55	8·6	0·6	9·2	16·4	17·5		M.
		Means	36·2	.	.	.	7·7	.	.	14·6	.		
22	17188*a*	Hallonquist's Cream	52·4	11·50	4·37	31·73	11·2	1·0	12·2	21·4	23·2	Maize starch. Contains ammonia = 0·89 p. c. $(NH_4)_2SO_4$.	Kenrick.
23	17188*b*		48·0	12·98	3·70	35·32	.	.	.	.	.		M.
		Means	50·2	12·24	4·04	33·52	.	.	.	.	.		
24	17189*a*	Jubilee	53·4	13·61	4·25	28·74	10·9	1·7	12·6	20·8	24·2	Maize starch	Kenrick.
25	17189*b*		51·7	10·34	3·95	34·01	.	.	.	.	.		M.
		Means	52·5	11·98	4·10	31·38	.	.	.	.	.		
26	19571*a*	Kitchen Queen	50·0	.	.	.	10·7	.	.	20·5	.	Maize starch	Edwards.
27	19571*b*		49·0	12·79	.	.	10·8	0·2	11·0	20·5	20·8		M.
28	20144*a*		.	12·10	.	.	.	.	9·7	.	18·5		Fagan.
29	20144*b*		52·1	11·88	4·05	31·97	10·6	1·2	11·8	20·3	22·5		M.
		Means	50·4	12·26	.	.	10·7	0·7	11·4	20·4	20·6		
30	18473*a*	Reliance	.	13·97	6·70	.	7·3	4·4	11·7	14·0	22·4	Maize starch	Ellis.
31	18473*b*		50·4	13·25	4·00	32·35	.	.	.	.	.		M.
		Means	.	13·61	5·35	.	.	.	.	.	.		

1. Starch has been separated by shaking, in cold solution, with 3 p. c. hydrochloric acid. Separated starch has been examined with the microscope as to kind and purity. Mineral matter found as 'ash,' on burning the starch, has been deducted from the 'crude starch.' This ash is invariably found to be alumina, rendered insoluble by the process of burning the alum.

2. This is the alumina found in solution, corrected by addition of alumina found in the separated starch.

3. In this figure are included bi-carbonate of soda, potash (soda or ammonia) present as sulphate, lime and moisture.

4. This does not necessarily account for all the bi-carbonate of soda originally present in the sample, but only for such part of it as has not been spontaneously decomposed since manufacture.

5. For method of valuing gas-producing power, see Notes 2 and 3 to Table II.

TABLE IV.—ALUM PHOSPHATE BAKING POWDERS.

Serial Number.	Departmental Number or Letter.	Name.	Starch.—See Note 1.	Phosphoric acid P_2O_5.	Sulphuric acid SO_3.	Alumina Al_2O_3.	Undetermined.—See Note 2.	Carbonic Acid Gas See Note 3. Available.	Carbonic Acid Gas See Note 3. Residual.	Carbonic Acid Gas See Note 3. Total.	Bi-Carbonate of Soda. See Note 4. Available.	Bi-Carbonate of Soda. See Note 4. Total.	Remarks.	Analyst.
1	19296*a*	Barton's	52·2	4·67	8·92	2·75	31·46	10·6			20·2		Maize-starch. CaO = 1·9 p. c.	Harrison.
2	19296*b*		48·0	5·12	9·37	2·94	34·57	....						M.
		Means.	50·1	4·90	9·15	2·85	33·01	....						
3	20153*a*	Blue Ribbon	45·9	4·94	12·40					8·1		15·5	Maize-starch	Fagan.
4	20153*b*		46·5	5·48	10·89	3·63	33·50	9·4	1·1	10·5	18·0	20·0		M.
		Means	46·2	5·21	11·64	3·63	33·32			9·3		17·8		
5	18471*a*	Charm	54·7	2·72	10·79	4·20	27·59	8·1	2·4	10·5	15·4	20·1	Maize-starch	Ellis.
6	18471*b*		48·9	5·98	10·86	3·32	30·97	.....	....	...	...			M.
		Means	51·8	4·35	10·82	3·76	29·28	..	...					
7	17184*a*	Climax	47·1	3·85	14·29	3·43	31·33	9·9	1·1	11·0	18·9	21·0	Maize-starch	Kenrick.
	17184*b*		45·6	4·61	14·11	...	.....	....	...	.....	.	.		M.
		Means	46·3	4·23	14·20	.....	.....	.....	.	..		..		
9	19587*a*	Cook's Choice	49·4	6·77	13·98	4·23	25·62	2·9	..	.	5·5	....	Maize-starch	Fiset.
10	19587*b*		44·8	6·30	12·76	4·14	32·00	2·7	2·9	5·6	5·2	10·7		M.
		Means	47·1	6·54	13·37	4·19	28·81	2·8	...	.. ...	5·4	...		
11	19588*a*	Cook's Delight	44·7	6·83	10·35	3·92	34·20	6·9	.....	...	13·2	...	Maize-starch	Fiset.
12	19588*b*		42·6	5·70	8·36	2·21	41·13	6·9	3·0	9·9	13·2	23·1		M.
		Means	43·7	6·26	9·36	3·07	37·66	6·9	.....	.....	13·2	....		

13	19586*a*	Cook's Favourite	61·3	5·17	10·09	3·03	20·41	9·3	....	....	17·8	.....	Maize starch	Fiset.
14	19586*b*		60·6	4·82	6·60	1·96	26·02	9·1	..	...	17·5	. .		M.
		Means	61·0	5·00	8·35	2·50	23·22	9·2	....	... .	17·7	.....		
15	19300*a*	Crystal	50·2	2·10	12·61	3·66	31·43	11·5	... .	. .	22·0	...	Maize starch. CaO = 0·85 p.c. Is essentially an alum powder.	Harrison.
16	19300*b*		50·0	1·91	11·16	3·59	33·24	.....	....	.....	....	.....		M.
		Means	50·1	2·01	11·89	3·68	32·33		.....	.....	..	.....		
17	19569*a*	Choice Crystal	35·8	.....	18·8	....	.....	9·7	....	....	.....	.....	Maize starch. Is essentially an alum powder.	Edwards.
18	19569*b*		38·3	1·3	19·2	3·75	37·45	11·5	0·6	12·1	21·9	23·0		M.
		Means	37·1	.....	19·0	.....	.....	10·6	.....	...	.....	...		
19	18469*a*	Dairy Cream	45·3	2·17	19·56	3·70	29·27	8·7	1·9	10·6	16·6	20·3	Maize starch. Is essentially an alum powder.	Ellis.
20	18469*b*		39·9	2·86	19·80	4 77	32·67	.....	.....	.....	.....	. ..		M.
21	19570*a*		.....	...	. ..	.....	.....	8·4	....	.....	16·1	....		Edwards.
22	19570*b*		38·8	1·19	20·2	4·35	35·46	11·2	0·6	11·8	21·3	22·4		M.
		Means	41·3	2·07	19·85	4·27	32·47	9·5	1·3	10·8	18·0	21·4		
23	18470*a*	Daisy	50·4	6·14	12·39	3·80	27·27	6·3	4·6	10·3	12·7	19·7	Maize starch	Ellis.
24	18470*b*		45·5	7·48	13·25	3·93	29·84	.. .	.....	.	... ..	.....		M.
		Means	48·0	6·81	12·82	3·87	28·56	.. ..	... ..	....	. ..	.....		
25	19298*a*	Dominion	43·0	1·55	17·30	3·22	34·93	10·6	...	.....	20·2	.... .	Maize starch. CaO = 4·6 p. c. Is essentially an alum powder.	Harrison.
26	19298*b*		40·5	2·17	17·50	4·30	35·53	.....	... ..	... ..	.....	.....		M.
		Means	41·8	1·86	17·40	3·76	35·23	.....	.....	... ..	.. ..	... ..		
27	19565*a*	Eagle	39·6	.....	.....	.....	.....	8·3	.....	.....	15·9	.....	Maize starch	Edwards.
28	19565*b*		43·1	4·91	13·77	3·65	34·57	9·1	... ..	.....	17·3	.....		M.
29	19593*a*		44·5	5·43	14·75	4·09	31 23	9·4	.....	.....	17·9	.....		Fiset.
30	19593*b*		44·8	5·00	12·10	3·10	35·00	7·3	3·3	10·6	13 9	20·2		M.
		Means	43·0	5·11	13·54	3·61	33·60	8·5	.....	.....	16 2	.. .		
31	19301*a*	Forest City	47·0	4·84	12·27	3·07	32·82	12·4	.....	.....	23·7	....	Maize starch. CaO = 2·3 p. c.	Harrison.
32	19301*b*		46·2	5·25	10·30	4·04	34·21	... .		14·2	.....	27·1		M.
		Means	46·6	5·05	11·29	3·56	33·52	.. .	... ..	.....	. ..	.....		

TABLE IV.—ALUM PHOSPHATE BAKING POWDERS—*Continued.*

Serial Number.	Departmental Number or Letter.	Name.	Starch.—See Note 1.	Phosphoric acid P_2O_5.	Sulphuric acid SO_3.	Alumina Al_2O_3.	Undetermined.—See Note 2.	Carbonic Acid Gas See Note 3. Available.	Carbonic Acid Gas See Note 3. Residual.	Carbonic Acid Gas See Note 3. Total.	Bi-Carbonate of Soda. See Note 4. Available.	Bi-Carbonate of Soda. See Note 4. Total.	Remarks.	Analyst.
33	20143*a*	Golden Crown	42·1	5·93	8·41	.....	.....	9·3	.....	.....	17·8	.....	Maize starch	Fagan.
34	20143*b*		50·4	4·97	8·92	2·81	32·9	9·9	2·3	12·2	18·8	23·1		M.
		Means	46·2	5·45	8·67	.....	.....	9·6	.....	.....	18·3	.....		
35	17185*a*	Gold Standard	52·5	5·34	9·74	3·47	28·95	9·0	1·4	10·4	17·2	20·0	Maize starch	Kenrick.
36	17185*b*		.....	4·35	8·82	.....	.....	.....	.....	.....	.....	.....		M.
37	17192*a*		55·8	4·55	9·04	3·56	27·05	9·8	1·5	11·3	18·8	21·7		Kenrick.
38	17192*b*		52·7	...	8·99	...	.....	.....	.....	.....	.....	.....		M.
		Means	52·2	4·75	9·15	3·52	30·38	9·4	1·5	10·9	18·0	20·9		
39	18472*a*	Jersey Cream	...	...	11·72	4·20	.....	4·3	2·5	6·8	8·1	12·9	Maize starch	Ellis.
40	18472*b*		53·8	6·14	10·54	4·20	25·32	.....	.....	7·0	...	13·4		M.
		Means	.....	.....	.....	.....	.....	.....	.....	6·9	.....	13·2		
41	19591*a*	Lily White	45·7	4·60	15·30	3·32	31·08	6·4	...	.....	12·2	...	Maize starch	Fiset.
42	19591*b*		45·8	4·20	11·50	2·24	36·26	6·4	5·8	12·2	12·2	19·4		M.
		Means	45·7	4·40	13·40	2·78	33·67	6·4	.....	.....	12·2	.....		
43	17679*a*	Magic	38·7	.....	.....	.....	.....	8·1	2·0	10·1	15·4	19·3	Maize starch	Bowman.
44	17679*b*		45·7	4·35	9·27	.....	.....	.....	.....	.....	.....	.....		M.
45	18478*a*		45·4	4·73	14·32	5·30	30·25	7·4	5·6	13·0	11·8	24·7		Ellis.
46	18478*b*		38·8	6·59	13·12	4·54	36·95	.....	.....	.....	.....	.....		M.
47	20146*a*		.....	4·67	9·61	.....	.....	.....	.....	7·9	.....	15·1		Fagan.
48	20146*b*		49·4	3·93	9·06	2·77	34·84	7·4	1·2	8·6	14·2	16·4		M.
		Means	43·6	4·86	11·08	4·20	34·01	7·7	2·9	10·6	13·8	18·9		

49	19297*a*	Mayell's Cream	38·0	4·37	14·28	4·14	39·21	10·1	. . .	. . . .	19·3	. . . .	Maize starch	Harrison.
50	19297*b*		35·5	6·32	15·80	4·18	38·20	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .		M.
		Means	36·8	5·35	15·04	4·16	38·70	. . . . .	. . .	. . . .	. . . . .	. . .		
51	19572*a*	Newman's.	48·0	. . . . .	. . .	. . .	. . . . .	6·1	. . .	. . . .	11·6	. . . . .	Maize starch	Edwards.
52	19572*b*		46·9	3·58	13·46	3·99	32·07	7·3	1·1	8·4	14·0	16·1		M.
		Means	47·5	. . .	. . . . .	. . . . .	. . . .	6·7	. . .	. . .	12·8	. . . .		
53	18477*a*	Ocean Wave	53·3	4·41	12·51	5·50	24·28	8·0	3·6	11·6	15·3	22·2	Maize starch	Ellis.
54	18477*b*		46·4	5·94	10·88	3·92	32·66	11·2	1·6	12·8	21·4	24·4		M.
55	192 9*a*		48·5	3·97	12·61	3·32	31·60	10·1	. . . . .	. . . . .	19·3	. . . .		Harrison.
56	19299*b*		. . .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. . . .	12·8	. . . .	24·4		M.
57	20149*a*		43 1	2·26	15·10	3·20	36·34	. . .	. . . . .	12·0	. . . .	22·9		Fagan.
58	20149*b*		45·4	4·79	12·01	4·01	33·79	8·6	1·2	9·8	14·2	18·7		M.
		Means	47·3	4·27	12·62	3·99	31·73	9·5	2·1	11·8	18·2	22·6		
59	19595*a*	On Top	37·7	7·00	15·09	4·08	36·13	6·7	. . . .	. . . .	12·8	. . . .	Maize starch	Fiset.
60	19595*b*		39·6	6·58	10·70	4·00	39·12	6·1	. . .	11·1	11·7	21·2		M.
		Means	38·7	6·79	12·90	4·04	37·63	6·4	. . . .	. . . .	12·2	. .		
61	18462*a*	Paradise	43·5	. . . . .	10·24	. . . . .	. . . . .	7·2	3·1	10·3	13·8	19·6	Maize and rice starch. Another sample contained 49·4 p.c. starch.	Valade.
62	18462*b*		46·4	5·40	9·24	3·02	35·94	11·6	0·9	12·5	22·1	23·8		M.
		Means	45·0	. . . .	9·74	. . . . .	. . . . .	9·4	2·0	11·4	17·5	21·7		
63	19589*a*	Pearce	42·6	5·16	14·61	4·16	33·47	8·2	. . . . .	. . .	15·7	. . . .	Maize starch	Fiset.
64	19589*b*		45·4	5.02	12·25	3·54	33·79	8·1	1·7	9·8	15·6	18·7		M.
		Means	44·0	5·09	13·43	3·85	33·63	8·2	. . . . .	. . . . .	15 7	. . . .		
65	20147*a*	Purity	46·9	6·60	12·36	. . .	. . . . .	. . . . .	. . . . .	10·1	. . .	19·3	Maize starch	Fagan.
66	20147*b*		50·0	5·31	9·48	3·34	31·87	9·4	0·5	9·9	17·8	18·8		M.
		Means	48·5	5·96	10·92	. . . .	. . . . .	. .	. . . .	10·0	. . . . .	19·1		
67	M	Regal	61·7	1·82	6·42	2·27	27·39	11·8	1·6	13·4	22·5	25·6	Maize starch. Is essentially an alum p'wdr.	M.
68	17187*a*	Smith's Cream	51·3	4·88	11·16	3·20	29·46	10·3	1·7	12·0	19·6	22·8	Maize starch	Kenrick.
69	17187*b*		47·0	5·75	9·76	2·77	34·72	. . . . .	. . . .	. . . . .	. . . . .	. . . . .		M.
		Means	49·2	5·32	10·46	2·99	32·09	. . .	. . . . .	. . . .	. . . . .	. . . .		

TABLE IV.—ALUM PHOSPHATE BAKING POWDERS—*Concluded.*

Serial Number.	Departmental Number or Letter.	Name.	Starch.—See Note 1.	Phosphoric acid P_2O_5.	Sulphuric acid SO_3.	Alumina Al_2O_3.	Undetermined.—See Note 2.	Carbonic Acid Gas See Note 3.			Bi-Carbonate of Soda. See Note 4.		Remarks.	Analyst.
								Available.	Residual.	Total.	Available.	Total.		
70	19574*a*	Vienna	35·1	..	..	..	..	2·9	....	..	5·4	..	Maize starch. Contains tartaric acid equivalent to 12·1 p.c. cream tartar.	Edwards.
71	19574*b*		28·3	5·28	15·28	4·32	46·82	5·1	0·5	5·6	9·7	10·7		M.
		Means ..	31·7	....	..	..	....	4·0	....	....	7·7	....		
72	17183*a*	West End	51·2	5·06	9·59	3·38	30·77	10·1	1·4	11·5	19·2	21·9	Maize starch	Kenrick.
73	17183*b*		49·6	4·99	7·80	2·56	35·05	....	....	....	....	....		M.
		Means	50·4	5·03	8·70	2·97	32·91	....	....	....	....	....		
74	17186*a*	White Star	51·2	5·07	9·81	3·20	30·72	9·2	2·2	11·4	17·6	21·9	Maize starch	Kenrick.
75	17186*b*		47·0	5·81	9·82	2·81	34·56	....	....	....	....	....		M.
76	17191*a*		50·4	4·98	9·82	3·37	31·43	9·8	1·4	11·2	18·8	21·5		Kenrick.
77	17191*b*		48·5	4·39	9·23	2·58	35·30	..	....	....	..	....		M.
78	20156*a*			4·67	8·92	....	....	....	....	7·1	....	13·5		Fagan.
79	20156*b*		47·2	6·19	9·68	2·83	34·10	7·1	1·7	8·8	13·5	16·8		M.
		Means	49·0	5·20	9·55	2·96	33·37	8·7	1·8	10·5	16·6	20·1		
80	18461*a*	Windsor	45·6	2·97	10·49	....	....	5·8	1·4	7·3	11·2	13·9	Maize and rice starches. CaO = 5·28 p.c.	Valade.
81	18461*b*		41·9	4·81	10·40	2·54	40·35	....	....	....	....	....		M.
82	19590*a*		43·8	5·04	13·92	3·56	33·68	10·5	....	....	20·1	..		Fiset.
83	19590*b*		43·9	....	....	..	....	10·3	....	....	19·6	....		M.
		Means	43·8	4·27	11·60	3·05	37·28	8·9	....	..	17·0	....		

Notes to Table IV.

1. For method used in starch estimation *see* Note 1 to Table III.
2. This number includes bi-carbonate of soda; alkalies present as sulphates, with the alum; lime and moisture.
3. For method of estimating gas, *see* Notes 2 and 3 to Table II.
4. The bi-carbonate of soda stated in this column is that present as such in the powder at the time of analysis. It may fall much below the amount normally present in the sample, since that converted into sulphate, phosphate, &c., through spontaneous deterioration, is excluded.

TABLE V.—A Study of Substances used as Acid Components of Baking Powder.

No.	Nature of Acid Component.	History.	Acidity per 100 grammes stated in cc. normal.		100 parts by weight of the acid component react with given parts bi-carbonate of soda.	Percentage composition of a mixture of maximum gas producing power.		Gas produced by 100 parts of such mixture.	Composition of a mixture reduced by starch to yield 13 per cent of gas.			Remarks.
			Theory.	Experiment. (Phenolphthalein)		Acid component.	Bi-carbonate of soda.		Acid component.	Bi-carbonate of soda.	Starch.	
1	Bi-tartrate of potash	Bull. 12, p. 16	532	532	44·7	69	31	16·2	55·4	24·9	19·7	
2	Free tartaric acid		1,333	1,333	112·0	47	53	27·8	21·9	24·9	53·2	
	Ammonium alum—											
3	Crystallized	Bull. 26, p. 15	661	618	54·4	64·7	35·3	18·5	45·4	24·9	29·7	
4	"Burnt" to loss 38 1 p.c	"		990	83·2	54·5	45·5	23·8	29·7	24·9	45·4	
5	" 62·5 p.c	"		1,556	130·7	43·4	56·6	29·6	19·0	24·9	56·1	
6	Overburnt	"		1,160	97·4	50·7	49·3	25·8	25·1	24·9	50·0	
	Potash alum—											
7	Crystallized		632		54·4	65·0	35·0	18·5	45·4	24·9	29·7	SO_3=35·7 p.c.
8	"Burnt" to loss of 38·5 p.c	Experiment		1,368	114·9	46·5	53 5	28·0	21·5	24·9	53·6	SO_3=57·9 p.c.
9	" 36·4 p.c	"		1,368	114·9	46·5	53·5	28·0	21·5	24·9	53·6	SO_3=56·7 p.c.
10	" 49·5 p.c	"		1,544	129·7	43·6	56·4	29·5	19·1	24·9	56·0	SO_3=66·6 p.c.
	"Burnt alum" of commerce—											
11	Sample No. 1	Bull. 26, p. 17		1,176	99 0	50·2	49·8	26·0	25·1	24·9	50·0	
12	" 2	Customs Dept		1,428	120·0	45·5	54·5	28·5	20·7	24·9	54·4	SO_3=63·9 p.c.
13	" 3	"		1,254	105·3	48·7	51·3	26·9	23·4	24·9	51·7	SO_3=63·2 p.c.
14	" 4	"		1,478	124·2	44·6	55·4	29·0	19·9	24·9	55·2	SO_3=62·9 p.c.
	Sulphate of alumina—											
15	Dry		1,754		147·3	40·5	59·5	31·2	16·8	24·9	58·3	
16	Crystallized			904	75·9	57·1	42·9	22·5	32·9	24·9	42 2	
17	Burnt to loss of 25·6 p.c			1,208	101·5	49·6	50·4	26·4	24·2	24·9	50·9	
18	" 42·4 p.c			1,552	130·4	43·4	56.6	29·6	19·0	24·9	56·1	
19	" 45·6 p.c			1,616	135·7	42·4	57·6	30·1	18·3	24·9	56·8	
	Acidphosphate of lime—											
20	"Straight" phosphate	Bull. 26, p. 19		690	58·0	63·3	36·7	19·2	42·8	24·9	32·3	P_2O_5=23·25 p.c. SO_3=29·70 p.c.
21	" "	Another sample		542	45·5	68·7	31·3	16·4	54·4	24·9	20·7	
22	"Leeched" "	Bull. 26, p. 19		495	41·6	70·6	29·4	15·4	59·5	24·9	15·6	Contained 52·0 p.c. starch.
23	" "	Another sample		586	49·2	67·0	33·0	17 3	50·2	24·9	24·9	
24	Rumford Ch. works—1	Furnished through a friend		618	51·9	65·8	34·2	17·9	47·8	24·9	27·3	P_2O_5=30·25 p.c., SO_3=12·5 p.c. starch=14·9 p.c.
25	" 2	" "		610	51·2	66·1	33·9	17·7	48·6	24 9	26·5	P_2O_5=26·68 p.c., SO_3=20·2 p.c. starch=5·76.
	Bi-sulphate of potash—											
26	Dry		735		61·7	61·8	38·2	20·0	40·1	24·9	35·0	
27	Burnt alum	Customs Dept		1,320	110·9	47·4	52·6	27·5	22·4	24·9	52·7	An ammonia alum.

APPENDIX L.

BULLETIN No. 69.—CONDENSED MILK, 1900.

JUNE 15, 1900.

E. MIALL, Esq.,
Commissioner of Inland Revenue.

SIR,—The accompanying tables give the results of analysis of 70 samples of condensed milks, representing 12 different brands. These samples were collected in December of last year, and the results tabulated are accredited to the various district analysts by whom the analyses were made.

Where two lines of figures are found after any sample, the lower line shows the results of analysis of a duplicate sample taken from the same tin and made in this laboratory.

The last bulletin (No. 54) issued by this department on the subject of condensed milk had regard to collections made in November, 1897. No special instructions were furnished to the analysts as to the methods to be employed in analysis, and both the district analysts and those at the central laboratory used the generally accredited methods as found described in the manuals. (See Commercial Organic Analysis, by A. H. Allen, vol. IV, p. 229. Principles and Practice of Agricultural Analysis by H. W. Wiley, vol. III, p. 485, and Dairy Chemistry, by H. D. Richmond, p. 116.)

These methods possess in common the feature of reducing the sample to the limpidity of normal milk by addition of a proper amount of water, and the subsequent treatment of the diluted article as in the case of normal milk. Where the milk has been condensed without addition of sugar this process works quite well; but the presence of any considerable percentage of cane sugar interferes with the extraction of the fat, and hence yields results which recent work shows to be from about 1 to as much as 2·5 per cent below the truth. This difficulty was pointed out by Mr. Otto Hehner some twenty years ago (The Analyst, 1879, vol. IV, p. 45), but his observation has not found its way into the recognized works on condensed milk analysis, and was overlooked by me in 1897. Mr. Hehner's suggestions for overcoming the difficulty, caused by the presence of a large proportion of sugar, have been examined in this laboratory during the last year (see Appendix) but have not been found altogether satisfactory. The best results have been obtained by alternate extraction with petroleum ether and water; and it is by this method of working that the results (on fat) have been obtained as set forth in the accompanying tables.

Mr. Macfarlane, Chief Analyst of this department, has done a large amount of investigation work, in this connection. In part of this work he has collaborated with Dr. J. Geisler, of New York (on behalf of the New York Condensed Milk Company), and to this company, together with the Canadian condensed milk companies at Antigonish, Truro, Baldwin's Mills and Winnipeg, the thanks of this laboratory are due, for their having kindly facilitated the examination of methods by supplying samples of their products whose history could be vouched for.

The details of the investigation work referred to are given in an appendix, and I have added a table which gives, in synoptic form, a comparison of the results for fat obtained by the methods adopted in 1897 with those obtained by the improved methods now in use. It will be seen that the methods which ignore the presence and retarding influence of cane sugar, yield too low a percentage of fat by about 1 to $2\frac{1}{2}$ units; and this error has caused the analyst, in several cases, to ascribe to the skimming of the milk, a lack of butter fat which was only apparent, and due entirely to

faulty methods of analysis. This has been done in Bulletin 54, in the cases of the following brands, viz. :—Eagle, Milkmaid, Nestles and Reindeer. Samples of these brands on analysis by the improved methods, yield respectively, 2·45, 1·36, 1·58 and 2·05 per cent of fat more than they yielded to the older methods; and are thus placed beyond all suspicion of having been made from other than whole milk.

Mr. Macfarlane's experimental work (which forms the appendix to this bulletin) is of the highest importance, and will, doubtless, become classic upon the subject with which it deals. It has fallen to me to put it into shape for the printer (owing to Mr. Macfarlane's absence in Europe), and I beg to recommend the whole for publication together, with the accompanying letter from Dr. Ellis, which bears upon this subject.

I have the honour to be, sir,

Your obedient servant,

A. McGILL,
Acting Chief Analyst.

February 3, 1900

THOMAS MACFARLANE, Esq,. F.R.S.C.,
Chief Analyst, Inland Revenue Department,
Ottawa.

DEAR SIR,—In forming an opinion of the genuineness or otherwise of the samples of milk reported in the inclosed certificates, I was guided by the following considerations:—

The solids not fat in the original milk are made up of albuminoids, lactose and ash. In the condensed milk these are increased by cane sugar added. A portion of this cane sugar is liable to undergo inversion in which case it will be reckoned lactose in the analysis and will go to increase the quantity of the solids not fat.

If the fat in the original milk is reckoned from the proportion which it bears to the solids not fat any inversion of cane sugar, or any other increase in the apparent percentage of solids not fat, will lower the fat in the original milk as shown by calculation.

The quantity of albuminoids reduced from the nitrogen determined by Kjeldahl's process, is a value which can be got with more accuracy than either the lactose or the cane sugar, and is one of the most constant constituents of milk.

I have therefore calculated the fat in the original milk by the following formula: $\mathcal{F}' = \frac{3{\cdot}6\,f}{c}$ where f = fat found per cent in condensed milk ; $\mathcal{F}'$ = fat per cent in original milk ; c = albuminoids per cent in condensed milk ; 3·6 = albuminoids per cent in normal milk (3·55 = mean of 793 analyses Koenig, p. 295.)

The results by this formula are as follows :—

20621 Owl $\mathcal{F}'$=	4·3
20922 Export	3·9
20623 Reindeer	3·7
20624 Jubilee	3·5
20625 Eagle	3·5
20645 Nestlé	3·46
20646 Milkmaid	3·3
20647 Export	4·5
20648 Eagle	3·5
20649 Owl	3·7

I have reported in accordance with these results.

Yours truly,

W. H. ELLIS.

RESULTS of the Examination of 70

No. of Sample.	Date of Collection.	Brand.	Factory No.	Quantity purchased.	Price.	Name and Address of Vendor.	Name and Address of Manufacturer.
	1899.				Cts.		
20601	Dec.	'Owl'				Duplicate sample obtained from factory.	Canada Milk Condensing Co., Antigonish, N.S.
20602	"	'Export'	801			" "	Baldwin Condensed Milk Co., Baldwin's Mills, P.Q.
20603	"	'Reindeer'	495			" "	Truro Condensed Milk and Canning Co., Truro, N.S.
20604	"	'Jubilee'	323			" "	The Manitoba Dairy Co., Winnipeg, Man.
20605	"	'Eagle'	60421			" "	New York Condensed Milk Co
						Halifax, N.S.	
16754	" 8	'Owl'		1 tin.	15	W. E. Crowe, Gottingen St.	Canada Milk Condensing Co., Antigonish, N.S.
16755	" 8	'Mayflower'		"	15	A. M. Boutilier & Co., Gottingen St.	Truro Condensed Milk Co., Truro, N.S.
16756	" 8	'Milkmaid'		"	20	" "	Anglo-Swiss Condensed Milk Co., Cham, Switzerland.
16757	" 9	'Reindeer'		"	20	E. W. Crease, Argyle St.	Truro Condensed Milk and Canning Co., Truro, N.S.
16758	" 9	'Owl'		"	15	W. C. Anderson, Granville St.	Canada Milk Condensing Co., Antigonish, N.S.
20606	"	'Owl'				Duplicate sample obtained from factory.	" "
20607	"	'Export'	801			" "	Baldwin Condensed Milk Co., Baldwin's Mills, P.Q.
20608	"	'Reindeer'	495			" "	Truro Condensed Milk and Canning Co., Truro, N.S.
20609	"	'Jubilee'	323			" "	The Manitoba Dairy Co., Winnipeg, Man.
20610	"	'Eagle'	60421			" "	New York Condensed Milk Co
						Quebec.	
19655	" 27	'Reindeer'		1 tin.	20	E. Clarke, Bridge St.	Truro Condensed Milk and Canning Co., Truro, N.S.
19656	" 27	'Owl'		"	20	G. Turcotte, 122 St. John St.	Canada Milk Condensing Co., Antigonish, N.S.
19657	" 27	'Nestle's'		"	25	P. F. Rinfret, 156 St. John St.	Henri Nestle, Switzerland
19658	" 27	'Export'		"	20	J. Savard, 35 St. John St.	Baldwin Condensed Milk Co., Baldwin's Mills, P.Q.
19659	" 27	'Milkmaid'		"	25	J. E. Dubé, St. John St.	Anglo-Swiss Condensed Milk Co., Cham, Switzerland.
19660	" 28	'Viking'		"	20	A. Grenier, 94 St. John St.	Norwegian Milk Condensing Co.
20611	Dec.	'Owl'				Duplicate sample obtained from factory.	Canada Milk Condensing Co., Antigonish, N.S.
20612	"	'Export'	801			" "	Baldwin Condensed Milk Co., Baldwin's Mills, P.Q.
20613	"	'Reindeer'	495			" "	Truro Condensed Milk and Canning Co., Truro, N.S.
20614	"	'Jubilee'	323			" "	The Manitoba Dairy Co., Winnipeg, Man.
20615	"	'Eagle'	60421			" "	New York Condensed Milk Co

SESSIONAL PAPER No. 14

Samples of Condensed Milk.

Results of Analysis.										Name of Analyst.	Official Analyst's Remarks.	No. of Sample.
Water.	Butter Fat.	Reducing Sugar as Lactose.	Albumenoids by Kjeldahl.	Ash.	Cane Sugar.	Specific Gravity of 20 p.c. Solution.	Original Gravity.	Concentration.	Total Solids.			
p. c.	p. c.	p. c.	p. c.	p. c.	p. c.				p. c.			
30·05	9·77	10·79	8·06	1·87	39·46	1·0440	1·282	2·872	69·95	M. Bowman, Halifax, N.S.	Genuine.....	20601
26·52	10·07	13·32	7·88	1·98	40·23	1·0465	1·303	3·265	73·48	" ..	"	20602
26·92	9·12	12·73	7·50	1·87	41·06	1·0469	1·306	3·120	73·08	" ..	"	20603
32·37	8·35	13·06	7·38	1·79	37·05	1·0437	1·279	3·074	67·63	" ..	"	20604
29·82	8·04	12·02	7·50	1·80	40·82	1·0456	1·295	2·984	70·18	" ..	"	20605
30·71	8·59	15·31	7·50	1·92	35·97	·0451	1·293	3·460	69·29	" ..	"	16754
30·55	7·80	16·69	7·87	2·00	35·09							
28·94	9·31	11·55	7·50	1 95	40·75	1·0461	1·299	2·949	71·06	" ..	"	16755
29·90	8·40	14·91	8·31	2·00	36·48							
27·03	9·82	14·76	8·94	2·12	37·33	1·0461	1·299	3·625	72·97	" ..	"	16756
28·10	9·00	19·70	9·81	2·10	31·29							
27·47	9·55	14·79	8·26	1·89	38·04	1·0465	1·303	3·513	72·53	" ..	"	16757
27·80	8·60	17·10	8·37	2·00	36·13							
29·82	8·28	24·58	7·19	1·99	28·14	1·0465	1·303	4·755	70·18	" ..	"	16758
29·75	7·65	21·21	7·95	1·80	31·64							
29·27	9·85	12·52	8·63	1·67	38·06	1·0451	1·2912	3·36	70·73	Dr. M. Fiset, Quebec.	.....	20606
26·17	9·95	12·83	8·63	1·77	40·65	1·0470	1·3072	3·47	73·83	" ..	Genuine.....	20607
26·57	9·00	13·27	7·80	1 80	41·56	1·0472	1·3088	3·42	73·43	" ..	"	20608
31·60	8·30	13·41	8·44	1·55	36·70	1·0441	1·2829	3·43	68·40	"	"	20609
28·57	8·05	12·32	7·38	1·65	42·03	1·0466	1·3038	3·18	71·43	" ..	"	20610
31·50	9 20	16·43	7·69	1·79	33·39	1·0446	1·2870	3·80	68·50	" .	"	19655
30·65	9 20	18·47	8·37	1·90	31·41							
30·20	8·15	13·32	8·13	1·70	38·50	1·0459	1·2979	3·44	69·80	" ..	"	19656
30·90	8·50	12·93	8·68	2·10	36·89							
26·80	9·15	15·00	8·63	1·69	38·73	1·0474	1·3106	3·78	73·20	" ..	"	19657
27·50	9·60	14·64	9·25	1·90	37·11							
27·07	10·15	12·72	8·69	1·59	39·78	1·0467	1·3046	3·42	72·93	" ..	"	19658
26·90	10·30	14·93	9·18	1·90	38·79							
25·25	9·35	14·43	8·75	2·06	40·16	1·0491	1·3253	3·82	74·75	" .	"	19659
24·55	9·20	14·64	9·18	2·10	40·33							
66·23	9·05	12·38	8·80	1·89	None.	1·0175	1·0959	2·89	33·77	" ..	"	19660
28·84	10·14	10·01	8·23	1·99	40·79	1·0432	1·275	2·43	71·16	Dr. J. B. Edwards, Montreal	"	20611
26·23	9·92	11·18	8·09	2·04	42·54	1·0455	1·294	2·49	73·77	" ..	"	20612
25·71	9·45	11·14	7·88	1·98	43·84	1·0466	1·303	2 43	74·29	" ..	"	20613
31·93	8·50	10·70	7·39	1·86	39·62	1·0437	1·279	2 27	68·07	" ..	"	20614
28·90	8·37	10·31	6·15	1·84	44·07	1 0457	1·296	2·16	71·10	" ..	"	20615

RESULTS of the Examination of 70

No. of Sample.	Date of Collection.	Brand.	Factory No.	Quantity purchased.	Price.	Name and Address of Vendor.	Name and Address of Manufacturer.
	1899.				Cts.		
20601	Dec.	'Owl'				Duplicate sample obtained from factory.	Canada Milk Condensing Co., Antigonish, N.S.
20602	"	'Export'	801			" "	Baldwin Condensed Milk Co., Baldwin's Mills, P.Q.
20603	"	'Reindeer'	495			" "	Truro Condensed Milk and Canning Co., Truro, N.S.
20604	"	'Jubilee'	323			" "	The Manitoba Dairy Co., Winnipeg, Man.
20605	"	'Eagle'	60421			" "	New York Condensed Milk Co
						Halifax, N.S.	
16754	" 8	'Owl'		1 tin.	15	W. E. Crowe, Gottingen St.	Canada Milk Condensing Co., Antigonish, N.S.
16755	" 8	'Mayflower'		"	15	A. M. Boutilier & Co., Gottingen St.	Truro Condensed Milk Co., Truro, N.S.
16756	" 8	'Milkmaid'		"	20	" "	Anglo-Swiss Condensed Milk Co., Cham, Switzerland.
16757	" 9	'Reindeer'		"	20	E. W. Crease, Argyle St.	Truro Condensed Milk and Canning Co., Truro, N.S.
16758	" 9	'Owl'		"	15	W. C. Anderson, Granville St.	Canada Milk Condensing Co., Antigonish, N.S.
20606	"	'Owl'				Duplicate sample obtained from factory.	" "
20607	"	'Export'	801			" "	Baldwin Condensed Milk Co., Baldwin's Mills, P.Q.
20608	"	'Reindeer'	495			" "	Truro Condensed Milk and Canning Co., Truro, N.S.
20609	"	'Jubilee'	323			" "	The Manitoba Dairy Co., Winnipeg, Man.
20610	"	'Eagle'	60421			" "	New York Condensed Milk Co
						Quebec.	
19655	" 27	'Reindeer'		1 tin.	20	E. Clarke, Bridge St.	Truro Condensed Milk and Canning Co., Truro, N.S.
19656	" 27	'Owl'		"	20	G. Turcotte, 122 St. John St.	Canada Milk Condensing Co., Antigonish, N.S.
19657	" 27	'Nestle's'		"	25	P. F. Rinfret, 156 St. John St.	Henri Nestle, Switzerland
19658	" 27	'Export'		"	20	J. Savard, 35 St. John St.	Baldwin Condensed Milk Co., Baldwin's Mills, P.Q.
19659	" 27	'Milkmaid'		"	25	J. E. Dubé, St. John St.	Anglo-Swiss Condensed Milk Co., Cham, Switzerland.
19660	" 28	'Viking'		"	20	A. Grenier, 94 St. John St.	Norwegian Milk Condensing Co..
20611	Dec.	'Owl'				Duplicate sample obtained from factory.	Canada Milk Condensing Co., Antigonish, N.S.
20612	"	'Export'	801			" "	Baldwin Condensed Milk Co., Baldwin's Mills, P.Q.
20613	"	'Reindeer'	495			" "	Truro Condensed Milk and Canning Co., Truro, N.S.
20614	"	'Jubilee'	323			" "	The Manitoba Dairy Co., Winnipeg, Man.
20615	"	'Eagle'	60421			" "	New York Condensed Milk Co

SESSIONAL PAPER No. 14

Samples of Condensed Milk.

Results of Analysis.										Name of Analyst.	Official Analyst's Remarks.	No. of Sample.
Water.	Butter Fat.	Reducing Sugar as Lactose.	Albumenoids by Kjeldahl.	Ash.	Cane Sugar.	Specific Gravity of 20 p.c. Solution.	Original Gravity.	Concentration.	Total Solids.			
p. c.	p. c.	p. c.	p. c.	p. c.	p. c.				p. c.			
30·05	9·77	10·79	8·06	1·87	39·46	1·0440	1·282	2·872	69·95	M. Bowman, Halifax, N.S.	Genuine.....	20601
26·52	10·07	13·32	7·88	1·98	40·23	1·0465	1·303	3·265	73·48	" ..	"	20602
26·92	9·12	12·73	7·50	1·87	41·06	1·0469	1·306	3·120	73·08	" ..	"	20603
32·37	8·35	13·06	7·38	1·79	37·05	1·0437	1·279	3·074	67·63	" ..	"	20604
29·82	8·04	12·02	7·50	1·80	40·82	1·0456	1·295	2·984	70·18	" ..	"	20605
30·71	8·59	15·31	7·50	1·92	35·97	·0451	1·293	3·460	69·29	" ..	"	16754
30·55	7·80	16·69	7·87	2·00	35·09							
28·94	9·31	11·55	7·50	1 95	40·75	1·0461	1·299	2·949	71·06	" ..	"	16755
29·90	8·40	14·91	8·31	2·00	36·48							
27·03	9·82	14·76	8·94	2·12	37·33	1·0461	1·299	3·625	72·97	" ..	"	16756
28·10	9·00	19·70	9·81	2·10	31·29							
27·47	9·55	14·79	8·26	1·89	38·04	1·0465	1·303	3·513	72·53	" ..	"	16757
27·80	8·60	17·10	8·37	2·00	36·13							
29·82	8·28	24·58	7·19	1·99	28·14	1·0465	1·303	4·755	70·18	" ..	"	16758
29·75	7·65	21·21	7·95	1·80	31·64							
29·27	9·85	12·52	8·63	1·67	38·06	1·0451	1·2912	3·36	70·73	Dr. M. Fiset, Quebec.	.. ..	20606
26·17	9·95	12·83	8·63	1·77	40·65	1·0470	1·3072	3·47	73·83	" ..	Genuine.....	20607
26·57	9·00	13·27	7·80	1 80	41·56	1·0472	1·3088	3·42	73·43	" ..	"	20608
31·60	8·30	13·41	8·44	1·55	36·70	1·0441	1·2829	3·43	68·40	"	"	20609
28·57	8·05	12·32	7·38	1·65	42·03	1·0466	1·3038	3·18	71·43	" ..	"	20610
31·50	9 20	16·43	7·69	1·79	33·39	1·0446	1·2870	3·80	68·50	" .	"	19655
30·65	9 20	18·47	8·37	1·90	31·41							
30·20	8·15	13·32	8·13	1·70	38·50	1·0459	1·2979	3·44	69·80	" ..	"	19656
30·90	8·50	12·93	8·68	2·10	36·89							
26·80	9·15	15·00	8·63	1·69	38·73	1·0474	1·3106	3·78	73·20	" ..	"	19657
27·50	9·60	14·64	9·25	1·90	37·11							
27·07	10·15	12·72	8·69	1·59	39·78	1·0467	1·3046	3·42	72·93	" ..	"	19658
26·90	10·30	14·93	9·18	1·90	38·79							
25·25	9·35	14·43	8·75	2·06	40·16	1·0491	1·3253	3·82	74·75	" .	"	19659
24·55	9·20	14·64	9·18	2·10	40·33							
66·23	9·05	12·38	8·80	1·89	None.	1·0175	1·0959	2·89	33·77	" ..	"	19660
28·84	10·14	10·01	8·23	1·99	40·79	1·0432	1·275	2·43	71·16	Dr. J. B. Edwards, Montreal	"	20611
26·23	9·92	11·18	8·09	2·04	42·54	1·0455	1·294	2·49	73·77	" ..	"	20612
25·71	9·45	11·14	7·88	1·98	43·84	1·0466	1·303	2 43	74·29	" ..	"	20613
31·93	8·50	10·70	7·39	1·86	39·62	1·0437	1·279	2 27	68·07	" ..	"	20614
28·90	8·37	10·31	6·15	1·84	44·07	1 0457	1·296	2·16	71·10	" ..	"	20615

RESULTS of the Examination of 70

No. of Samples.	Date of Collection.	Brand.	Factory No.	Quantity purchased.	Price.	Name and Address of Vendor.	Name and Address of Manufacturer.
	1899.				Cts.	*Montreal.*	
19649	Dec. 14	'Eagle'		1 tin.	25	Jules Hirtz, 564½ Craig St.	New York Condensed Milk Co
						St. Hyacinthe.	
19650	" 16	'Nestle's'		"	25	Pagnuelo Bros., Cascade St.	Henri Nestle, Switzerland.....
19651	" 16	'Reindeer'....		"	18	" "	Truro Condensed Milk and Canning Co., Truro, N.S.
						Montreal.	
19652	" 18	'Owl'.....		"	20	Gravel Frères, 12 St. Lawrence St.	Canada Milk Condensing Co., Antigonish, N.S.
19653	" 18	'Export'.....		"	20	" "	Baldwin Condensed Milk Co., Baldwin's Mills, P.Q.
19654	" 18	'Mayflower'		"	15	T. A. Wood & Co., Berthelot St.	Truro Condensed Milk Co., Truro, N.S.
20616		'Owl'				Duplicate sample obtained from factory.	Canada Milk Condensing Co., Antigonish, N.S.
20617		'Export'.....	801			" "	Baldwin Condensed Milk Co., Baldwin's Mills, P.Q.
20618		'Reindeer'....	495			" "	Truro Condensed Milk and Canning Co., Truro, N.S.
20619		'Jubilee'.....	323			" "	The Manitoba Dairy Co., Winnipeg, Man.
20620		'Eagle'.....	60421			" "	New York Condensed Milk Co..
						Ottawa.	
20641	8	'Nestle's'		1 tin.	25	W. H. Roger, Rideau St.	Henri Nestle, Switzerland.....
20642	8	'Highland			25	A. M. Bélanger, Rideau St.	Helvetia Milk Condensing Co., Highland, Ill., U.S.A.
20643	8	'Canadian'			18	A. E. Cowan, Sparks St.	Baldwin Condensed Milk Co., Baldwin's Mills, P.Q.
20644	8	'Reindeer'..			20	R. McGregor, Sparks St.	Truro Condensed Milk and Canning Co., Truro, N.S.
20621		'Owl'.....				Duplicate sample obtained from factory.	Canada Milk Condensing Co., Antigonish, N.S.
20622		'Export'....	801			" "	Baldwin Condensed Milk Co., Baldwin's Mills, P.Q.
20623		'Reindeer'...	495			" "	Truro Condensed Milk and Canning Co., Truro, N.S.
20624		'Jubilee'.....	323			" "	The Manitoba Dairy Co., Winnipeg, Man.
20625		'Eagle'.....	60421			" "	New York Condensed Milk Co..
						Toronto.	
20645	24	'Nestle's'		1 tin.	25	E. G. Lemaitre, 256 Queen St.	Henri Nestle, Switzerland.....
20646	24	'Milkmaid			15	J. Butcher, 300 Queen St.	Anglo-Swiss Condensed Milk Co.
20647	24	'Export'...			20	W. Massen, 99 Queen St.	Baldwin's Condensed Milk Co., Baldwin's Mills, P.Q.

SESSIONAL PAPER No. 1

Samples of Condensed Milk—*Continued.*

Results of Analysis.										Name of Analyst.	Official Analyst's Remarks.	No. of Sample.
Water.	Butter Fat.	Reducing Sugar as Lactose.	Albumenoids by Kjeldahl.	Ash.	Cane Sugar.	Specific Gravity of 20 p.c. Solution.	Original Gravity.	Concentration.	Total Solids.			
p. c.	p. c.	p. c.	p. c.	p. c.	p. c.				p. c.			
31·48	7·83	6·34	7·62	1·99	44·74	1·0449	1·289	1·90	68·52	Dr. J. B. Edwards, Montreal	Genuine.....	19649
29·20	7·85	15·32	8·15	1·90	37·58							
28·04	8·06	15·23	7·68	1·94	39·05	1·0470	1·307	2·63	71·96	" ..	"	19650
27·95	8·75	18·74	9·12	2·40	33·04							
27·70	8·02	10·42	8·69	1·76	43·41	1·0465	1·302	2·31	72·30	" ..	"	19651
27·30	8 60	16·15	8·75	1·80	37·40							
30·34	7·06	11·82	7·03	1·94	41·81	1·0460	1·298	2·22	69·66	" ..	"	19652
30·15	7·85	15·46	8·37	2·00	36·17							
27·76	11·04	3·32	6·71	2·03	48·64	1·0445	1·286	1·88	72·24	" ..	"	19653
26·40	10·20	13·69	8·31	1·80	39·60							
30·03	8·31	12·67	8·24	1·82	38·93	1·0454	1·293	2·48	69·97	" ..	"	19654
29·55	8·55	19·29	8·56	1·70	33·35							
27·90	9·28	12·26	7·74	1·95	39·74	1·0445	1·286	3·20	72·10	Dr. F. X. Valade, Ottawa.	"	20616
24·67	10·55	14·97	8·12	1·87	39·94	1·0465	1·303	3·49	75·33	" ..	"	20617
25·45	10·57	17·81	8·96	1·79	34·09	1·0472	1·301	4·19	74·55	" .	"	20618
28·51	8·33	12·58	7·86	1·72	42·03	1·0440	1·282	2·91	71·49	" ..	"	20619
28·03	8·77	12·95	8·32	1·72	39·12	1·045	1·290	3·35	71·97	" ..	"	20620
23·73	9·18	17·93	7·14	2·02	41·76	1·047	1·307	3·57	76·27	" ..	"	20641
26·70	8·80	16·42	9·81	2·16								
68·15	9·04	11·77	8·45	1·79	None.	1·017	1·093	2·69	31·85	" ..	Very sour, yellow, spoiled, adulterated and unwholesome.	20642
26·77	8·62	13·01	7·37	1·74	43·38	1·0455	1·295	2·96	73·23	" .	Genuine.....	20643
29·85	8·40	14·09	8·92	2·00	36·74							
27·63	9·74	17·31	7·11	1·74	44·87	1·048	1·316	3·94	82·37	" ..	"	20644
26·75	8·20	15·60	9·37	2·00	38·08							
28·99	9·77	9·08	7·96	1·70	42·50	1·0470	1·3072	2·46	71·01	Dr. W. H. Ellis, Toronto.	"	20621
25·71	9·96	13·75	9·17	1·91	39·50	1·0480	1·3158	3·61	74·29	" .	"	20622
25·62	9·52	13·89	9·13	1·89	38·95	1·0486	1·3210	3·30	74·38	" ..	"	20623
33·13	8·03	13 07	8·15	1·75	37·87	1·0449	1·2882	3·15	68 87	" ..	"	20624
28·15	7·92	11·56	8·14	1·74	42·49	1·0472	1·3106	3·32	71·85	" ..	"	20625
25·72	9·38	19·10	9·82	3·94	34·04	1·0483	1·3184	2·94	74·28	" ..	"	20645
27·05	9·30	16·69	8·81	2·20	35·95							
25·48	8·66	17·24	9·46	2·13	37·03	1.0494	1·3280	2·70	74·52	" ..	Made from milk a little below the average in butter fat.	20646
26·45	8·15	17·92	8·31	2·30	36·87							
25·76	11·05	11·63	8·84	1·96	41·70	1·0470	1·2072	4·42	74·24	..	Genuine.....	20647
26·60	10·20	14·78	7·87	1·70	38·85							

RESULTS of the Examination of 70

No. of Sample.	Date of Collection.	Brand.	Factory No.	Quantity purchased.	Price.	Name and Address of Vendor.	Name and Address of Manufacturer.
	1899.				Cts.	*Peterboro.*	
20648	Dec. 23	'Eagle'		1 tin..	25	J. D. Tully	New York Condensed Milk Co...
20649	" 23	'Reindeer'		" .	15	Spot Cash Store	Truro Condensed Milk and Canning Co., Truro, N.S.
20626	" ..	'Owl'				Duplicate sample obtained from factory.	Canada Milk Condensing Co., Antigonish, N.S.
20627	" .	'Export'	801			" " ..	Baldwin Condensed Milk Co., Baldwin's Mills, P.Q.
20628	" ..	'Reindeer'	495			" " ..	Truro Condensed Milk and Canning Co., Truro, N.S.
20629	" ..	'Jubilee'	323			" " ..	The Manitoba Dairy Co., Winnipeg, Man.
20630	" ..	'Eagle'	60421			" " ..	New York Condensed Milk Co ..
						London, Ont.	
19324	" 7	'Milkmaid'		1 tin..	25	Cairncross&Lawrence, Dundas St.	Anglo-Swiss Condensed Milk Co.
19325	" 7	'Eagle'		" .	30	J. Callard, 390 Richmond St.	New York Condensed Milk Co ..
19226	" 7	'Canadian'		" .	25	W. W. Emerson, 120 Dundas St.	Baldwin Condensed Milk Co., Balwin's Mills, P.Q.
20631	" ..	'Owl'				Duplicate sample obtained from factory.	Canada Milk Condensing Co., Antigonish, N.S.
20632	" ..	'Export'	801			" " ..	Baldwin Condensed Milk Co., Baldwin's Mills, P.Q.
20633	" ..	'Reindeer'	495			" " ..	Truro Condensed Milk and Canning Co., Truro, N.S.
20634	" ..	'Eagle'	60421			" " ..	New York Condensed Milk Co..
20640	" .	'Eagle'	60681			" " .	" " ..
						Winnipeg, Man.	
17223	" 18	'Reindeer'		1 tin..	15	K. McKenzie & Co.	Truro Condensed Milk and Canning Co., Truro, N.S.
17224	" 18	'Mayflower'		" .	15	" " ..	" " ..
17225	" 18	'Export'		"	15	" " ..	Baldwin Condensed Milk Co., Baldwin's Mills, P.Q.
17226	" 19	'Clover'		" .	10	E. Nicholson	Truro Condensed Milk and Canning Co., Truro, N.S.
17227	" 19	'Mayflower'		" .	15	"	" " ..
. . .	" 19	'Jubilee'	323			Duplicate sample obtained from factory.	The Manitoba Dairy Co., Winnipeg, Man.

SESSIONAL PAPER No. 14

Samples of Condensed Milk—*Concluded.*

Results of Analysis.										Name of Analyst.	Official Analyst's Remarks.	No. of Sample.
Water.	Butter Fat.	Reducing Sugar as Lactose.	Albumenoids by Kjeldahl.	Ash.	Cane Sugar.	Specific Gravity of 20 p.c. Solution.	Original Gravity.	Concentration.	Total Solids.			
p. c.	p. c.	p. c.	p. c.	p. c.	p. c.				p. c.			
27·75	7·87	14·91	8·05	1·69	39·72	1·0480	1·3157	2·87	72·25	Dr. W. H. Ellis, Toronto.	Genuine	20648
28·65	7·70	14·23	7·95	1 90	39·57							
30·72	9·00	11·29	8·85	1·97	38·17	1·0446	1·287	3·21	69·28	"	"	20649
29·10	7·35	12·93	7·43	1·90	41·29							
28·65	10·15	12·06	8·26	1·91	38·97	1·0447	1·2880	3·09	71·35	F. T. Harrison, London, O.	"	20626
25·70	10·30	14·34	8·73	1·92	39·01	1·0469	1·3064	3·52	74·30	"	"	20627
26·10	9·50	13·41	8·16	1·88	40·95	1·0471	1·3046	3·29	73·90	"	"	20628
31·35	9·10	13·54	7·83	1·82	36·36	1·0444	1·2855	3·21	68·65	"	"	20629
29·00	9·45	12·80	8·03	1·76	38·96	1·0468	1·3055	3·18	71·0	"	"	20630
25·65	9·65	15·17	8·78	2·09	38·66	1·0482	1·3175	3·70	74·35	"	"	19324
27·35	8·55	16·69	8·81	2·00	36·60							
26·70	8·40	17·35	7·83	1·76	37·96	1·0479	1·3150	3·82	73·30	"	"	19325
29·65	8·80	16·42	8·12	1·80	35·21							
28·90	9·00	12·03	8·26	1·95	39·86	1·0459	1·2980	3·11	71·10	"	"	19326
31·60	8·75	12·59	8·92	1·80	36·34							
30·84	10·61	12·40	8·47	1·81	37·55	1·278			69·16	Prof. E. B. Kenrick, Winnipeg, Man.		20631
27·58	10·46	12·10	8·87	1·83	40·92	1·301			72·42	"		20632
27·33	9·56	13.42	8·32	1·80	41·44	1·310			72·67	"		20633
30·60	8·92	11·37	8·26	1·82	38·90	1·294			69·40	"		20634
28·78	8·27	12·48	8·42		41·53	1·310			71·22	"		20640
28·53	8·92	12·21	8·35		42·03	1·305			71·47	"		17223
28·75	9·50	11·63	8·37	1·90	39·85							
28·19	9·57	12·04	8·37	1·79	41·61	1·305			71·81	"		17224
27·60	9·10	16·55	7·37	1·70	37·68							
26·69	11·50	12·35	8·50	1·80	41·07	1·300			73·31	"		17225
26·30	10·15	13·69	8·25	1·60	40·91							
27·62	5·55	13·35	8·47	1·85	45·37	1·341			72·38	"		17226
28·50	5·30	16·15	8·25	2·00	39·80							
28·51	9·28	15·70	8 02		39·04	1·305			71·49	"		17227
28·90	8·70	13·69	7·37	1·80	39·54							
32·15	9·62	11·30	8·61	1·85	38·45	1·277			67·85	"		323

A Comparison of the Results of Analysis of Condensed Milk for Butter Fat, by the Methods used in 1897 (*See* Bulletin 54) and those now in use in this laboratory.

Name of Brand.	Manufacturer	Bulletin No. 54 (1897.)		Present Bulletin.		Remarks.
		Number of Samples.	Mean Fat Found.	Number of Samples.	Mean Fat Found.	
Allworth's	Canadian Condensed Milk Co., Aylmer, Ont.	2	7·21			No samples of this brand were collected this year.
Allworth's Cream	" " "	1	8·24			" " "
Beaver	Truro Condensed Milk and Canning Co., Truro, N.S.	1	1·35			" "
Buffalo	The LaBorderie Co., LaBorderie, Man.	3	0·81			" "
Canadian	Baldwin Condensed Milk Co., Baldwin's Mills, P.Q.	6	7·87	2	8·69	An average increase of 0·82 per cent fat found.
Clover	Truro Condensed Milk and Canning Co., Truro, N.S.			1	5·43	No samples of this brand were collected in 1897.
Duchess	Forest Canning Co., Halifax, N.S	1	0·51			" " this year.
Eagle	New York Condensed Milk Co	9	5·92	11	8·37	An average increase of 2·45 per cent of fat found.
"	(Specially collected)			12	9·15	
				23	8·78	Average of total number of samples analyzed.
Export	Baldwin Condensed Milk Co., Baldwin's Mills, P.Q.	6	8·18	11	10·33	An average increase of 2·15 per cent of fat found.
	(Specially collected)			2	10·30	
				13	10·32	Average of total number of samples analyzed.
Highland	Helvetia Condensed Milk Co., Highland, Ill.	6	8·93	1	9·04	An average increase of 0·11 per cent of fat found.
Jersey	Forest Canning Co., Halifax, N.S	9	6·25			No samples of this brand were collected this year.
Jubilee	The Manitoba Dairy Co., Winnipeg, Man.			7	8·60	" " in 1897.
	(Specially collected)			2	8·74	
				9	8·63	Average of total number of samples analyzed.
Mayflower	Truro Condensed Milk Co., Truro, N.S	2	6·86	4	8·94	An average increase of 2·08 per cent of fat found.
Milkmaid	Anglo-Swiss Condensed Milk Co., Cham, Switzerland.	12	7·69	4	9·05	" " 1·36 " "

Nestle's	Henri Nestle, Switzerland	14	7·40	4	8·98	"	"	1·58	"	"	
Owl	Canada Milk Condensing Co., Antigonish	6	7·93	11	9·23	"	"	1·30	"	"	
	(Specially collected)			2	10·20						
				13	9·38	Average of total number of samples analyzed.					
Reindeer	Truro Condensed Milk and Canning Co.,	21	7·16	13	9·21	An average increase of 2·05 per cent of fat found.					
	(Specially collected)			2	9·53						
				15	9·25	Average of total number of samples analyzed.					
Viking	Norwegian Milk Condensing Co	4	9·24	1	9·05	An average decrease of 0·19 per cent of fat found.					

APPENDIX L, BULLETIN 69.

The Estimation of Fat in Condensed Milks Containing Cane Sugar.

The fact that the presence of cane sugar in milk retards the extraction of the fat by solvents (ether, petroleum, &c.,) has long been known; but it has been thought that a longer than usual exposure to the action of the solvent would overcome this difficulty, and the manuals upon the subject of milk analysis either make no special reference to the matter, or merely recommend a somewhat prolonged extraction. Recent investigation, as shown in the sequel, has proven the practical impossibility of obtaining the whole of the fat, without first removing the sugar. This important observation was first brought to the knowledge of this laboratory by Dr. J. Geisler of New York; and much of the work which follows was done in collaboration with this gentleman. It is now known that the difficulty of extracting fat in presence of sugar was pointed out by Mr. Otto Hehner as long ago as 1879 (The Analyst, Vol. IV., p. 45,) and it is much to be regretted that the recognised treatises on milk analysis have omitted to take notice of his important observation. Mr. Hehner sought to solve the difficulty by precipitating casein and fat together and extracting the fat from the coagulum. This method of working has been tested in this laboratory by Mr. Macfarlane, and has been found less satisfactory than the alternate treatment with petroleum ether and water.

The following assays illustrate this point :—

Name of Sample.	Casein and Fat.	Casein.	Fat, by Difference.	Fat, by Weight.	Fat, by Asbestos Method.
Jubilee	18·40 18·35	10·20 10·07	8·20 8·28	8·26 8·52	8·55
Export	20·70 20·76	11·16 11·46	9·54 9·30	9·48 9.16	10·40
Owl	21·00 20·92	10·62 10·62	10·38 10·30	10·26 10·22	10·40
Reindeer	18·74 18·92	9·68 9·76	9·06 9·16	9·04 9·02	9·52

These results show that nothing would be gained by substituting the Hehner in place of the Asbestos process.

In order to demonstrate the effect of differences in the method of working, as applied to the same sample, seven samples (each consisting of three tins) were purchased in March of last year, from certain vendors in Ontario. The samples selected were of the Eagle Brand, made by the New York Condensed Milk Co. One tin of each sample was sent to Dr. J. Geisler of New York, one to Dr. W. H. Ellis of Toronto,

and the third was analyzed by Mr. Macfarlane in this laboratory. The results obtained are stated in the following table :—

No. of Sample.	Dr. Ellis.		Dr. Geisler.		I. R. Laboratory.	
	Water.	Fat.	Water.	Fat.	Water.	Fat.
18133	27·30	6.30	26·81	9·68	29·40	9·67
18134	27·25	6·55	25·42	10·10	28·37	9·35
18135	27·25	6·10	26·49	9·82	28·16	9·80
18137	26·54	8·09	25·54	9·69	28·12	9·95
18138	26·79	6·66	26·42	10·17	28·12	8·95
18140	27·11	7·51	26·60	9·79	27·45	9·37
18142	27·85	5·83	27·25	10·37	28·30	8·62
Averages		6·72		9·94		9·39

In comparing these determinations, it must be remembered that they were made on different tins, and that the latter possibly represented products derived from different runnings at widely different times. By means of the factory numbers on the tins, the officers of the New York company were able to ascertain that they had been produced on different dates, from September 2, 1896 to June 4, 1898. At the same time this fact was not sufficient to account for the great difference (3·22 per cent) between the averages of Dr. Ellis and Dr. Geisler's determinations of the fat, nor perhaps for the difference (0·55 per cent) between Dr. Geisler's results and those obtained here. Dr. Ellis' analyses were made by the ordinarily accepted methods, i. e. a 20 per cent or 10 per cent solution of the condensed milk was made, and treated in crysotile fibre in the same manner as when analysing ordinary milk. The process used in the laboratory was as follows :—20 ccm. of a 10 per cent solution of the condensed milk sample were placed in a large sized Macfarlane tube containing 'asbestos fibre,' and dried over night in the water-bath. The tubes were then weighed and steeped over night in cold petroleum ether, and in the morning washed out with the same solvent. After drying, the tubes were again weighed, the loss being regarded as butter fat. They were then lixiviated by passing through each of them 500 ccm. cold distilled water to remove the sugars, and dried and weighed again. Finally they were again treated with cold petroleum ether, and the loss sustained added to the first determination of butter fat. The extra amount thus obtained averaged 1·2 per cent. As before stated, the results obtained in this way are, as a rule, about 0·5 per cent lower than those of Dr. Geisler ; but it has to be remarked that the latter were obtained by extracting with ethyl ether, evaporating off the solvent, and weighing the extract, a method which is known to yield too high results. (See, *Commercial Organic Analyses*, by A. H. Allen, Vol. IV., p. 229 ; *Principles and Practice of Agricultural Analysis*, by W. H. Wiley, Vol. III., p. 485, &c.)

In order to eliminate as far as possible any difference in the determination of the butter fat due to the samples having been taken from different 'runs' or 'batches,' the New York Condensed Milk Co. was requested to furnish to Dr. Geisler and to this laboratory duplicate cans from the same 'runs.' This the company very kindly consent-

-l to do, and reported to the department Dr. Geisler's results. The following is a comparison of the percentages of water and butter fat shown by the different analyses :—

	Dr. Geisler.		T. Macfarlane.	
	Water.	Fat.	Water.	Fat.
Eagle No. 60681	28·79	9·18	28·05	8·80
" No. 60421	28·45	9·33	28·65	9·20

From the foregoing figures it will be seen that the percentages of butter fat reported by Dr. Geisler were still the highest. In Mr Macfarlane's analyses the fat was determined by two hot extractions in Stutzer tubes with petroleum ether, and one intermediate lixiviation with cold water. Mr. Macfarlane also made four additional assays, in the same manner, of each sample, using 25 ccm of a 10 per cent solution in each tube. The different losses which they sustained are as follows :—

No. of Sample.	No. of Tube.	Water lost in drying.	Fat by first extraction.	Loss to 1 litre cold water.	Fat by second extraction.	Loss to 100 ccm cold water.	Fat by third extraction.	Total fat.	Total water extract
[illegible]	5	29·36	6·60	54·32	1·80	1.00	0·00	8·40	55·32
	6	29·20	6·68	54·32	1·72	0.92	0·00	8·60	55·24
	7	28·92	7·20	54·52	1·52	0.88	0·00	8·80	55·40
	8	29·28	7·32	54·48	1·12	0.96	0·12	8·76	55·44
	9	30·20	7·40	53·08	1·32	1.04	0·00	8·72	54·12
	10	29·64	7·02	53·52	2·00	0.84	0·00	9·02	54·36
[illegible]	11	30·08	7·20	50·84		3·04	1·48	8·68	53·88
	12	30·32	7·52	53·20	1·36	0·88	0·00	8·88	54·08

The work here tabulated shows that the fat is completely extracted by two treatments with petroleum ether, with an intermediate treatment by cold water; that a second treatment by cold water removes about 1 per cent of sugar. (?) It also shows that the error inherent in the method is $(0\cdot40+0\cdot34)\div2=0\cdot37$ per cent for butter fat, and $(0\cdot20+0\cdot48)\div2=0\cdot34$ per cent for the water extractive.

Many tests have been made in this laboratory to compare the percentages of fat obtained by loss with those resulting from the evaporation of the petroleum ether extract and weighing the fat. They have always been found to correspond very closely. In the case of the petroleum ether extracts from the four tubes numbered 9, 10, 11 and 12 in the foregoing statement, which contained 10 grammes of sample No. 60421, they gave, after complete dissipation of the solvent, 0·885 grammes fat. This is equal to 8·85 per cent, while the result obtained in calculating from loss is 8·83 per cent.

In order if possible to reduce the number of extractions and weighings in the method just detailed, another plan was tried in which the tubes were first leached out with water (both cold and warm water were applied) and then with cold petroleum ether. To test the efficacy of this method, both treatments were repeated a second

time. The results obtained in this manner, on the same samples, by Miss M. Tyrrell, assistant in this laboratory, are also here placed on record for future reference.

No. of Sample.	P.c. water lost in drying.	P.c loss to 1 Litre Water.	P.c. loss in first extraction with Pet. Ether.	P.c. loss to 500 ccm. Water.	P.c. loss in second extraction with Pet Ether.	Total p.c. Butter Fat.	Total p.c. Water Extract.
		Cold.		Cold.			
	28·05	48·85	8·35	6·35	0·25	8·60	54·90
60681	27·55	40·00	8·05	14·35	0·75	8·80	54·35
		Warm.		Warm.			
	27·70	54·90	8·55	1·05	0·15	8·70	55·95
	28·05	54·60	8·70	1·00	0·10	8·80	55·60
		Cold.		Cold.			
	28·65	48·20	8·75	5·60	0·45	9·20	53·80
60421	28·70	45·65	8·65	8·00	0·50	9·15	53·65
		Warm.		Warm.			
	28·85	53·75	8·70	0·95	0·25	8·95	54·70
	28·95	53·40	8·70	1·00	0·35	9·05	54·40

These figures show that no advantage has been gained in lixiviating with water first, because the ether extraction which followed was incomplete. The lixiviation with both cold and warm water gave perfectly clear solutions, showing no indication of fat on the surface. Such solutions have been frequently tested by shaking them up with petroleum ether, separating, and distilling off the latter, without obtaining more than traces of a substance soluble in ether. The amount of the latter never exceeded 0·05 per cent calculated on the original condensed milk.

It is important to note, as showing the limits of accuracy of this mode of treatment for fat extraction, that the three series of determinations given on this and the preceding pages, and referring to samples 60681 and 60421, yield mean fat percentages whose greatest variation for No. 60681 is 0·21, and for No. 60421 is 0·37, of one per cent. The average error inherent in the process, would therefore seem to be 0·29 per cent from this study. Taking this into consideration along with the statement on page 16, it seems demonstrated that the method of alternate extraction with petroleum ether and water is accurate to within 0·4 per cent fat.

In November, 1899, application was made to the New York Condensed Milk Co., and also to the Canadian Manufacturers at Antigonish, Truro, Baldwin's Mills and Winnipeg, requesting them to furnish this laboratory with ten duplicate tins from one 'run' or 'batch' in their respective factories, in order that one of each sample might be submitted to the various district analysts in the hope of obtaining concordant results from their analysis. These were distributed in December, 1899, along with samples bought in the open market, the same whose analysis appears in this bulletin. These latter consisted of one tin, half of which was sent to the analysts, and the other retained as a duplicate for analysis in this laboratory. The district analysts had been previously informed of the nature of the results obtained here, and of the necessity for removing the sugar contained in the milk before completing the fat extraction. As a rule the analysts adopted the following methods in making the necessary determinations :—

1. Water : drying 20 ccm of a 10 per cent solution in asbestos fibre.
2. Butter fat : extracting the dried milk in the asbestos with petroleum ether, lixiviating with water and extracting again with petroleum ether.
3. Lactose : precipitating casein and fat from a 20 per cent solution with dilute acetic acid, and determining the lactose in the filtrate by Fehling's solution.
4. Albuminoids : by Kjeldahl's method on a 20 per cent solution.
5. Ash : evaporating to dryness 25 ccm of a 20 per cent solution, and incinerating.
6. Cane sugar : by difference.

The methods adopted by Mr. Bowman, Halifax, and Professor Kenrick, Winnipeg, differed somewhat from the foregoing. The results obtained by the different analysts

are given in the tables contained in this bulletin. For purposes of comparison, the analysis of the sample tins from the different condensed milk factories are given in the following table:—

Result of analysing duplicate samples from certain 'runs' or batches of condensed milk produced in various factories.

Description of Samples and Names of Analysts.	Water.	Butter fat.	Lactose.	Albu-menoids	Ash.	Cane Sugar.
	p. c.	p. c.	p. c.	p. c.	p. c.	p. c.
From Auhgrmish, 'Ox' Brand—						
Mr. Bowman	30·05	9·77	10·79	8·06	1·87	39·46
Dr. Fiset	29·27	9·85	12·52	8·63	1·67	38·06
Dr. Edwards	28·84	10·14	10·01	8·23	1·99	40·79
Dr. Valade	27·90	9·28	12·26	7·74	1·95	39·74
Dr. Ellis	28·99	9·77	9·08	7·96	1·70	42·50
Mr. Harrison	28·65	10·15	12·06	8·26	1·91	38·97
Prof. Kenrick	30·84	10·61	12·40	8·47	1·81	37·55
Mr. Macfarlane	28·75	10·40	11·77	8·92	1·70	38·46
Average	29·16	9·99				
From Baldwin's Mills, 'Export,' No. 801—						
Mr. Bowman	26·52	10·07	13·32	7·88	1·98	40·23
Dr. Fiset	26·17	9·95	12·83	8·63	1·77	40·65
Dr. Edwards	26·23	9·92	11·18	8·09	2·04	42·54
Dr. Valade	24·67	10·55	14·97	8·12	1·87	39·94
Dr. Ellis	25·71	9·96	13·75	9·17	1·91	39·50
Mr. Harrison	25·70	10·30	14·34	8·73	1·92	39·01
Prof. Kenrick	27·58	10·36	12·10	8·87	1·83	40·92
Mr. Macfarlane	26·55	10·40	12·45	8·92	1·75	39·93
Average	26·05	10·20				
From Truro, 'Reindeer,' No. 495—						
Mr. Bowman	26·92	9·12	12·73	7·50	1·87	41·06
Dr. Fiset	26·57	9·00	13·27	7·80	1·80	41·56
Dr. Edwards	25·71	9·45	11·14	7·88	1·98	43·84
Dr. Valade	25·45	10·57	17·81	8·96	1·79	34·09
Dr. Ellis	25·62	9·52	13·89	9·13	1·89	38·95
Mr. Harrison	26·10	9·50	13·41	8·16	1·88	40·95
Prof. Kenrick	27·33	9·56	13·42	8·32	1·80	41·44
Mr. Macfarlane	27·10	9·65	12·99	8·75	1·55	39·96
Average	26·34	9·54				
From Winnipeg, 'Jubilee,' No. 323—						
Mr. Bowman	32·37	8·35	13·06	7·38	1·79	37·05
Dr. Fiset	31·60	8·30	13·41	8·44	1·55	36·70
Dr. Edwards	31·93	8·50	10·70	7·39	1·86	39·62
Dr. Valade	28·51	8·33	12·58	7·86	1·72	42·03
Dr. Ellis	33·13	8·03	13·07	8·15	1·75	37·87
Mr. Harrison	31·35	9·10	13·54	7·83	1·87	36·36
Prof. Kenrick	32·15	9·62	11·30	8·61	1·85	38·45
Mr. Macfarlane	31·45	8·90	11·77	8·66	2·00	37·22
Average	31·56	8·64				
From New York Co., 'Eagle,' No. 60,421—						
Mr. Bowman	29·82	8·04	12·02	7·50	1·80	40·82
Dr. Fiset	28·57	8·05	12·32	7·38	1·65	42·03
Dr. Edwards	28·90	8·37	10·31	7·02	1·84	43·56
Dr. Valade	28·03	8·77	12·95	8·32	1·72	39·12
Dr. Ellis	28·15	7·92	11·56	8·14	1·74	42·40
Mr. Harrison	29·09	9·45	12·80	8·03	1·76	38·96
Prof. Kenrick	30·60	8·92	11·37	8·26	1·82	38·90
Mr. Macfarlane	28·65	9·20	13·41	7·87	1·65	39·22
Average	28·96	8·59				

It has already been shown (see page 17) that the probable error inherent in the method, in the hands of the same analyst, is not greater the 0·4 per cent of fat. The table on the preceding page enables us to judge the probable error involved when the method is employed by different persons, if we assume that the sample tins furnished to the various analysts contained absolutely similar material. We have seen that they were intended to contain similar material, having for this purpose been taken, in each brand, from the same 'run' or 'batch.'

FAT percentages obtained by eight analysts.

Brand.	Mean.	Maximum.	Minimum.	Difference.
Owl	9·99	10·61	9·28	1·33
Export	10·20	10·55	9·92	0·63
Reindeer	9·54	10·57	9·12	1·45
Jubilee	8·64	9·62	8·03	1·59
Eagle	8·59	9·45	7·92	1·53
Mean difference Maximum and Minimum				1·31

It is impossible to believe that an error so great as that indicated could occur were the samples worked upon truly identical in character as these samples were intended to be; and if this conclusion be correct the inference is that, with the best intentions on the part of a manufacturer, uniformity of composition in his product is not possible and a variation of one (1) per cent, may occur on the fat content of one tin, as compared with another, of even the same batch. Of course this conclusion must not be considered as final, and it is only stated as a legitimate inference from the analytical results above tabulated.

As a check upon this I have studied the difference (as given in the accompanying bulletin) between the results obtained by the district analysts and those obtained in this laboratory upon thirty-two (32) samples—in the case of which each sample was taken from the same tin, after as thorough mixing as possible. The mean difference is 0·585 per cent fat. For 10 samples the difference is less than 0·25 per cent; for 4 samples it exceeds 1 per cent.

That the sample even in the contents of one can, is not homogenous has been maintained by Professor Kenrick, who contends, that even with thorough mixing, absolute uniformity is unattainable. Mr. Harrison thinks that the sample can be made uniform only by emptying the whole contents of the can on a large glass plate and mixing thoroughly with a spatula. The practice in this laboratory has been to thoroughly stir the contents of the can before removing the portion for analysis. The following conclusions, I quote in Mr. Macfarlane's own words. 'It seems to me, with this experience in view, that to take the position that the tins from one batch are of the same composition throughout and absolutely identical even as regards their minutest portions, is scarcely warranted. It is well known that the condensed milk, in the process of cooling, is apt to separate into portions of unequal composition, and that to prevent this continuous stirring is resorted to. Whether the latter, or any other means adopted to accomplish the desired end, is always and absolutely to be depended on, and whether no change in homogeneity takes place in the receptacle from which the tins are filled, may well be doubted. I for my part am not convinced that *absolute* uniformity of product is attainable in any condensed milk factory. In the duplicates from one and the same tin, which appear in the table of results forming this Bulletin, some of the percentages found by the district analysts agree very closely with those obtained in this laboratory, but there are others, which exhibit considerable differences; and where this is the case with the butter-fat, it very frequently happens that the lowest result of the two analyses is accompanied by a higher percentage of lactose. In fact, the latter constituent, the milk

sugar, seems to be most irregular and difficult of even distribution when a sample is being mixed. Very often an almost invisible crystalline deposit has formed which it is very difficult again to incorporate evenly throughout the viscid mass. In a tin containing condensed milk of this description, the upper part was poured off from the bottom part, in which crystalline particles had developed. These can be identified as milk sugar crystals under the microscope and when a small quantity is dissolved in the mouth, a gritty residue is left. The analysis of the separated portions resulted as follows :—

	Upper Part.	Bottom Part.
Water	28·00	23·65
Butterfat	10·25	8·40
Lactose	9·99	24·02
Albumenoids	8·75	7·68
Ash	1·90	1·80
Cane Sugar	41·11	34·45
	100·00	100·00

'From these figures, therefore, the opinion seems to be amply justified, that the differences found by analysts working on different portions of one sample are partly due to the practical impossibility of obtaining truly uniform portions of it.'

APPENDIX M.

BULLETIN No. 70.—FERTILIZERS, 1900.

OTTAWA, May 21, 1900.

W. J. GERALD, Esq.,
Acting Commissioner of Inland Revenue.

SIR,—As explained in the report on Fertilizers for last year (Bulletin No. 65), a change in the time and manner of making this report was then sanctioned by the Commissioner, in consequence of which I have now the honour to place before you, not only the results of analysing the standard samples of fertilizers which, in accordance with the provisions of the Fertilizers Act, have been supplied to the Department, but also the results of examining certain samples of fertilizers collected as sold in the open market. All particulars regarding the standard samples are given in No. I. of the tables appended to this report, while the 'fertilizers as sold' are described in Table II.

The number of standard samples has decreased since last year, as will be seen from the following statement :—

	Standard Samples.
In 1897 there were analysed	107
1898 " "	124
1899 " "	154
1900 " "	107

Last year a special circular was issued to manufacturers, requesting them to be careful, in furnishing the statements required by law, to specify the nature of the materials which enter into the composition of the fertilizer, and also to see that the precise results of analysis are given. They were also informed that 'should two percentages be stated as regards the contents of any one of the fertilizing constituents, the lowest percentage will always be taken as representing the guarantee of the manufacturer or vendor.' Nevertheless, omissions have been made this year also in many instances to state the nature of the materials, and in furnishing the exact particulars which 'a certificate of analysis' calls for. Possibly in some of these cases the result may be that a lower relative value is attached to them than would have been the case if the manufacturer had seen fit to make the declaration in question. The standard samples are given in Table I. attached to this report, and it will be observed that as a rule two lines of figures are given opposite the description of each sample; the upper line gives the quantities of fertilizing constituents guaranteed by the manufacturers, and the lower line the results of the analysis in this branch. The fourth column in the table states the materials from which the different fertilizers were manufactured in all cases where the informa-

tion has been supplied. The column headed 'Relative value per ton of 2,000 pounds,' gives the value of each fertilizer based upon the following prices for the fertilizing constituents:—

	Cents per pound.
Nitrogen in salt of ammonia or nitrates.	13
Organic nitrogen in ground bone, fish, blood or tankage	12
Phosphoric acid, soluble in water	6
" soluble in ammonium citrate.	$5\frac{1}{2}$
" insoluble in ground bone or tankage.	5
" insoluble in Thomas's phosphate powder	$3\frac{1}{2}$
" insoluble in ground rock phosphate.	$1\frac{1}{2}$
Potash contained in wood ashes	6
" in high grade potash salts	$5\frac{1}{4}$

Since it is impossible in chemical analysis to distinguish between insoluble phosphoric acid from apatite or rock phosphate and that from bone, the declaration of the manufacturer, as regards the material used, is accepted and the calculation based upon it. This declaration also affects the percentage stated in the column headed 'Phosphoric acid available,' the insoluble phosphoric acid from apatite not being reckoned as 'available.' Neither can the insoluble phosphoric acid, regarding the source of which no declaration has been made, be regarded as available. It may be remarked as regards the relative values that these figures afford no indication of the prices at which the goods ought to be sold, because, among other reasons, no regard has been paid to the cost of manufacturing or mixing.

It has been reported by some of the food inspectors of this branch, whose duty also includes the collection of fertilizer samples, that the meaning of the term 'available phosphoric acid' is not by any means clear to the purchasers of such goods, nor to the farming community generally. Since you may decide to cause this report to be published, it seems necessary to make some explanation here as regards the origin and signification of the term. The word 'available' used in the Fertilizers Act of 1890 was used long before that year for indicating the sum of the 'soluble' and the 'reverted' phosphoric acid found in analysing a fertilizer by the chemists of the various Agriculture Experiment Stations of the United States. The explanation given of these terms in the report of the Connecticut Agricultural Experiment Station for 1884 is as follows:—'Soluble phosphoric acid implies phosphoric acid or phosphates that are freely soluble in water. It is the characteristic ingredient of superphosphates, in which it is produced by acting or insoluble phosphates with oil of vitriol. Once well incorporated with the soil it gradually becomes reverted phosphoric acid. Reverted (reduced or precipitated) phosphoric acid means, strictly, phosphoric acid that was once easily soluble in water, but from chemical change has become insoluble in that liquid. In present usage the term signifies the phosphoric acid (of various phosphates) that is freely taken up by strong solution of ammonium citrate, which is therefore used in analysis to determine its quantity. Reverted phosphoric acid implies phosphates that are readily assimilated by crops.' In the same report, when giving the results of analysis, the 'soluble' and 'citrate soluble' phosphoric acid are added together and tabulated as available. This practice has been continued up to the present time not only in the reports of the Connecticut Station, but also in those of the Agricultural Experiment Stations in Massachusetts, Wisconsin, Kentucky, &c.

Of course it may be said that all the phosphoric acid contained in a fertilizer, including that characterised as 'insoluble' and which is neither dissolved by water nor by citrate of ammonia solution, sooner or later becomes available for plant food, but, generally speaking, a farmer who makes use of a fertilizer does so in order to obtain an

immediate result or an improved effect upon the crop coming next after the application, and the word 'available' is intended to express that which may be depended upon for immediate effect, say during the first year.

The manner in which the percentages of the various useful constituents of fertilizers is determined throughout the United States was carefully laid down by the Association of Official Agricultural Chemists in November 1898, and published in Bulletin No. 46, Revised Edition, of the U.S. Department of Agriculture in 1899. Owing to the proximity of the United States, and the large quantities of fertilizers imported from thence into Canada, the terms in use regarding them in the United States have been adopted in Canada, and the methods of analysis given in the above mentioned publication have been recommended by me for use by the district analysts of the Dominion.

It will be observed that in Table I. and in connection with samples 1146 and 1147, these are guaranteed to contain a certain percentage of 'citric soluble' phosphoric acid, an expression which has not heretofore found a place in our bulletins. Its meaning will be discussed when reference comes to be made to the fertilizers described in Table II. Meanwhile it may be remarked that the five standard samples of ground basic slag or Thomas phosphate powder show considerable differences as regards the quantity of available phosphoric acid which they contain, the percentage varying from 2·99 to 8·35.

With reference to the 'fertilizers as sold' described in Table II., in which the date of collection and the names of the vendors and manufacturers are given, it is to be observed that, in the most of cases, opposite the description of each sample there will be found three lines of figures. The first of these shows the contents guaranteed by the manufacturer, the second the percentage of fertilizing ingredients found in the sample submitted to the department by the manufacturer or vendor, and the third line gives the same percentages as contained in the sample collected. In cases where no standard samples have been submitted, and nevertheless, in contravention of the provisions of the Fertilizers Act, the fertilizers have been offered for sale, the first and second lines will of course show no figures.

According to the opinions expressed by the analysts, out of 59 samples collected, five have been found to be adulterated. Among them are three samples of Thomas Phosphate powder, which are challenged on account of their containing less than eight per cent of available phosphoric acid as required by the Act. The part of the Fertilizers Act invoked is section 7, 2, which reads as follows :—

'No fertilizer shall be sold or offered for sale unless it contains at least eight per cent of available phosphoric acid, or four per cent of ammonia or its equivalent in nitrogen or nitric acid ; or, when both phosphoric acid and ammonia are present, at least five per cent of available phosphoric acid and two per cent of ammonia or its equivalent in nitrogen or nitric acid.'

Since ground basic slag or Thomas phosphate powder contains no ammonia, the section just quoted requires that it should contain at least eight per cent of available phosphoric acid. The quantity of the latter found by the analysts in the samples analysed was much lower than eight per cent, and hence their condemnation of the fertilizer in question. To this proceeding, as carried out last year, some of the importers of Thomas phosphate powder, especially Messrs. Wallace & Fraser and Mr. Fred. T. Wedderburn of St. John, N.B., have very strongly objected, and asserted that the method of analysis adopted by this branch for ascertaining the percentage of available phosphoric acid does not give the true agricultural value of this particular fertilizer. These parties desire that the amount of soluble phosphoric acid should be determined according to Wagner's system, in which a two per cent solution of citric acid is substituted for a neutral solution of citrate of ammonia, and they bring forward analyses by Voelcker, Dyer and other eminent authorities in England, France and Germany showing a percentage of *citric* soluble phosphoric acid more than double that of the available phosphoric acid found by the Canadian analysts. I have not been able to comply with the wishes of the importers, or to influence the district analysts in the desired direction, for the following reasons :—

1. It would be inconvenient and possibly unjust to change a system which has been established for twelve years, and which is well understood by the fertilizer manufac-

turers and agriculturists of the Dominion, without at least substituting for it another which has the approval of a body of British Chemists having a reputation equally as high as that of the United States Association of Agricultural Chemists.

2. Such a body is the Society of Public Analysts in London, but it has not yet turned its attention to the matter of adopting uniform methods of analysis. Dr. Augustus Voelcker and Dr. Bernard Dyer are both distinguished members of the Society of Public Analysts, but their high reputation as individual chemists would not justify a change in our system, even in the event of their recommending it.

3. As a matter of fact they make no recommendation on the subject, and in their certificates of analysis of Thomas' phosphate powder, they do not characterise the citric soluble phosphoric acid as 'available.'

4. On the other hand, Dr. Paul Wagner, of Darmstadt, in his work 'Die Bewerthung der Thomasmehle,' maintains that the percentage of phosphoric acid dissolved by his 'new' solution (20 per cent citric acid) corresponds with the results of manure trials, and with the relative effect value (Wirkungswerth) of the Thomas powder. This has not yet, however, been confirmed by any British agricultural association of high standing, and is a study the subject of which lies beyond the limits of the activity of this Branch.

5. To apply a 2 per cent citric acid solution for determining the available phosphoric acid in Thomas' phosphate powder, and not to other fertilizers, would be a course calculated to occasion strong objections on the part of the fertilizer manufacturers of this country and of the United States.

6. The terms at present in use for describing fertilizers are already sufficiently complicated for our farmers, and much confusion would result from attempting to cause them to distinguish between 'citrate soluble' and 'citric soluble' phosphoric acid.

There is no doubt that this new fertilizer has obtained a considerable reputation in Germany and England, and that it is entitled to 'a fair field and no favour' in Canada. It may also be the case that, owing to its basic nature, the percentage of available phosphoric acid may be under-estimated by using in its analysis a neutral solution of citrate of ammonia It would therefore be only reasonable so to amend the Fertilizers' Act as to admit of the sale, inspection and analysis of the article without causing it to be condemned by the analysts as 'adulterated under the Act.' An attempt was made to accomplish this during the present session of parliament, when Mr. Domville, M P. introduced a bill to amend the Act in the supposed interest of importers of basic slag. The bill was referred to the Agricultural Committee of the House of Commons, before whom it was discussed on the 28th and 29th March last. Mr. Domville proposed that the section quoted above should be amended by the addition of the following words:—'And in the case of ground basic slag or Thomas' phosphate powder not less than twelve per cent of total phosphoric acid.' This was objected to because it avoided a determination of the available phosphoric acid, and opened a wide door for the adulteration of the basic slag by ground coprolite and apatite. On the other hand, the Minister of Inland Revenue proposed that the added amendment should run as follows:—'And in the case of ground basic slag or Thomas' phosphate powder, at least five per cent of available phosphoric acid, soluble in a neutral solution of citrate of ammonia.' Against this it was argued that it would throw an unjust implication on the basic slag, and expose it to the imputation of being unable to come up to the standard of other fertilizers. Nevertheless the Minister's amendment was adopted, and the bill reported in agreement therewith, although up to the present time of writing it has not been passed in the House of Commons.

Besides the three samples of ground basic slag or Thomas' phosphate powder which were thus challenged there are also eight samples described as unregistered, no standard samples of the brands they represent having been submitted to the department, and two samples which have been pronounced adulterated by the district analysts on account of deficiencies in their fertilizing constituents. In these cases the provisions of the Adulteration Act should be applied against the offenders.

I have appended to the tables certain 'Memoranda on Manures,' which have been found useful in former bulletins, and to which it is desired to give as wide a circulation as possible. I respectfully recommend the whole for publication.

I have the honour to be, sir,

Your obedient servant,

THOMAS MACFARLANE,

Chief Analyst.

TABLE I.—Statement of the Results of Examining 107 Standard

Number of Sample.	Name of Manufacturer.	By whom sent.	From what Materials Produced.	Name or Brand of Fertilizer.
1041	Imported	M. J. Henry, Vancouver, B.C.		'Muriate of Potash'— Guaranteed ... Found ...
1042				'Fine Bone'— Guaranteed ... Found ...
1043	The W. A. Freeman Co., Hamilton, Ont.	Manufacturers		'Dominion Flower Fertilizer'— Guaranteed ... Found ...
1044	The Wm. Davies Co., Toronto.		Dried blood, bones and tankage.	'Compound Fertilizer'— Guaranteed ... Found ...
1045	Bradley Fertilizer Co., 92 State St., Boston, U.S.			'Bradley's X L Superphosphate of Lime'— Guaranteed ... Found ...
1046				'Bradley's Eclipse Phosphate'— Guaranteed ... Found ...
1047				'Bradley's Potato Fertilizer'— Guaranteed ... Found ...
1048				'B. D. Sea Fowl Guano'— Guaranteed ... Found ...
1049				'Farmers' New Method Fertilizer'— Guaranteed ... Found ...
1050				'Bradley's Fine Ground Bone'— Guaranteed ... Found ...
1051				'Bradley's Dissolved Bone, with Potash'— Guaranteed ... Found ...
1052				'Bradley's Vermonter for all Crops'— Guaranteed ... Found ...
1053				'Bradley's Corn Phosphate'— Guaranteed ... Found ...
1054				'Bradley's Niagara Phosphate'— Guaranteed ... Found ...
1055	The Laing Packing and Provision Co., Montreal.		From Tankage and bones of hogs.	'Fertilizer' (Tankage)— Guaranteed ... Found ...
1056	The Ingersoll Packing Co., Ingersoll, Ont.			'Ingersoll Fertilizer'— Guaranteed ... Found ...
1057	The Thomas Phosphate Co.	J. C. Wallace, manager, Toronto.		'Thomas' Phosphate Powder'— Guaranteed ... Found ...

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Samples of Commercial Fertilizers, registered for 1900.

Results of Analysis.

Nitrogen.		Phosphoric Acid.					Potash.	Moisture.	Relative Value per Ton of 2,000 lbs.	Number of Sample.
Total, including that of Nitric Acid or Ammonia, if present.	Total Calculated as Ammonia.	Soluble in Water.	Reverted or Citrate, Soluble.	Insoluble.	Total.	Total Available.				
p. c.	p. c.	p. c.	p. c.	p. c.	p. c.	p. c.	p. c.	p. c.	$ cts.	
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1041
.....	.....	.....	.....	.....	.....	.....	52·91	0·36	55 56	
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1042
3·88	4·71	0·57	8·90	15·16	24·63	24·63	.....	5·48	34 94	
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1043
4·29	5·22	5·31	2·05	6·08	13·44	7·36	4·77	7·46	25 74	
7·82	9·50	0·35	.....	11·40	.....	.....	Traces.	9·43	30 58	1044
7·62	9·25	0·96	6·45	4·93	12·34	7·41	0·97	9·06	32 48	
2·07	2·50	8·00	.....	.....	10·00	.....	1·00	.....	.....	1045
2·29	2·79	5·95	4·02	3·01	12·98	9·97	2·49	13·20	20 58	
1·03	1·25	5·00	3·00	1·00	9·00	8·00	2·00	.....	14 17	1046
1·38	1·68	4·80	4·53	2·05	11·38	9·33	2·68	16·68	17·48	
2·06	2·50	5·00	3·00	2·00	10·00	8·00	3·00	.....	17 99	1047
2·06	2·50	6·08	4·47	3·01	13·56	10·55	3·57	10·98	21 81	
2·06	2·50	5·00	3·00	2·00	10·00	8·00	1·50	.....	16 42	1048
1·49	1·80	6·90	2·88	3·20	12·98	9·78	1·85	11·00	17 93	
0·82	1·00	5·00	3·00	2·00	10·00	8·00	2·15	.....	15 03	1049
1·32	1·60	5·63	4·03	2·05	11·71	9·66	2·36	16·74	17 45	
2 50	3·00	.....	.....	.....	21·00	.....	.....	.....	.....	1050
4·06	4·93	Traces.	6·53	16·50	23·03	23·03	.....	4·86	33 42	
0·82	1·00	5·00	3·00	2·00	10·00	8·00	2·15	.....	15·03	1051
1·43	1·73	5·60	2·88	1·92	10·40	8·48	2·21	18·20	16·22	
2·06	2·50	5·00	3·00	2·00	10·00	8·00	3·00	.....	17 99	1052
2·20	2·67	6·08	4·95	2·56	13 59	11·03	3·19	10·85	22·15	
2·06	2·50	5·00	3·00	2·00	10·00	8·00	1·50	.....	16 42	1053
2·20	2·67	5·92	4·73	2·94	13·59	10·65	2·95	10·55	21 56	
0·82	1·00	5·00	2·00	1·00	8·00	7·00	1·00	.....	11 52	1054
1·26	1·53	5·87	2·86	1·70	10·43	8·73	1·76	15·34	15 57	
4·12	5·00	.....	.....	.....	14·71	.....	.....	5·52	.....	1055
5·12	6·22	0·77	7·46	9·56	17·79	17·79	0·42	7·48	31 43	
7·41	9·00	.....	5·50	6·80	.....	.....	.....	6·00	30 63	1056
7·84	9·52	1·09	5 63	6·08	12·80	12·80	0·48	10·54	32 90	
.....	.....	.....	.....	.....	15·00	.....	.....	.....	.....	1057
0·22	0·27	0·13	4·74	12·60	17·47	4 87	0·31	0·02	15 06	

TABLE I.—Statement of the Results of Examining 107 Standard

Number of Sample.	Name of Manufacturer.	By whom sent.	From what Materials Produced.	Name or Brand of Fertilizer.
1058	Williams & Clark Fertilizer Co., 92 State St., Boston, Mass.	Manufacturers	.....	'Americus Corn Phosphate'— Guaranteed ..... Found .....
1059	" " "	"	.....	'Americus Potato Manure'— Guaranteed ..... Found .....
1060	" " "	"	.....	'Royal Bone Phosphate for all Crops'— Guaranteed ..... Found .....
1061	The Quinnipiac Co., 92 State St., Boston	"	.....	'Climax Phosphate'— Guaranteed ..... Found .....
1062	Hy. F. Tucker Co., State St., Boston.	"	.....	'Imperial Bone Superphosphate for all Crops'— Guaranteed ..... Found .....
1063	Pacific Guano Co., State St., Boston.	"	.....	'Soluble Pacific Guano' Guaranteed ..... Found .....
1064	" " "	"	.....	'Potato Special'— Guaranteed ..... Found .....
1065	" " "	"	.....	'Nobsque Guano'— Guaranteed ..... Found .....
1066	" " "	"	.....	'Pure Bone Meal'— Guaranteed ..... Found .....
1067	W. Faint, Peterboro, Ont.	"	.....	'Pure Ground Bone'— Guaranteed ..... Found .....
1068	Cumberland Bone Phosphate Co., State St., Boston.	"	.....	'Phosphate'— Guaranteed ..... Found .....
1069	" " "	"	.....	'Potato Fertilizer'— Guaranteed ..... Found .....
1070	" " "	"	.....	'Fine Ground Bone'— Guaranteed ..... Found .....
1071	The Cleveland Dryer Co., 92 State St., Boston.	"	.....	'Fertilizer for all Crops'— Guaranteed ..... Found .....
1072	W. Harris & Co., Danforth Avenue, Toronto.	"	.....	'Bone Meal'— Guaranteed ..... Found .....
1073	" " "	"	.....	'Brand H'— Guaranteed ..... Found .....
1074	The Nichols Chemical Co., Capelton, Que.	"	.....	'Capelton Superphosphate'— Guaranteed ..... Found .....
1075	" " "	"	.....	'The Royal Canadian'— Guaranteed ..... Found .....

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Samples of Commercial Fertilizers, registered for 1900.

Results of Analysis.										
Nitrogen.		Phosphoric Acid.				Potash.	Moisture.	Relative Value per Ton of 2,000 lbs.	Number of Sample.
Total, including that of Nitric Acid or Ammonia, if present.	Total Calculated as Ammonia.	Soluble in Water.	Reverted or Citrate, Soluble	Insoluble.	Total.	Total Available.			
p. c.	p. c.	p. c.	p. c.	p. c.	p. c.	p. c.	p. c.	p. c.	
2·06	2·50	5·00	3·00	2·00	10·00	8·00	1·50	.....	16 42	1058
2.16	2·62	7·27	2·01	3·26	12·54	9·28	1·85	10·20	19 03	
2·06	2·50	6 50	1·50	1·00	9·00	8·00	3·00	.....	17 84	1059
2·13	2·60	6·55	3·32	3·77	13·64	9·91	2·69	10·10	20 57	
1·03	1·25	5·00	3·00	2·00	10·00	8·00	2·00	.....	14 47	1060
1·35	1·64	5·83	2·49	2·30	10·62	10·62	2·01	17·45	17 39	
1·03	1·25	7·00	1·00	1·00	9·00	8·00	2·00	.....	14 37	1061
1·45	1·75	5·75	2·30	2·50	10·55	8·05	1·91	17·10	15 66	
1·03	1·25	5·00	3·00	1·00	9·00	8·00	2·00	.....	14 17	1062
1·38	1·68	5·59	2·40	2·50	10·49	7·99	2·04	16·97	15 55	
2·06	2·50	5·00	3·00	2·00	10·00	8·00	1·50	.....	16 42	1063
2·38	2 88	8·15	1·83	2·24	12·22	9·98	1·50	12·05	19 78	
2·06	2·50	6·00	2·00	1·00	9·00	8·00	3·00	.....	17 79	1064
2·35	2·85	6·29	3·11	4·03	13·43	9 40	2·74	10·70	20 70	
1·03	1·25	5·00	3·00	1·09	9·00	8·00	2·00	.....	14 17	1065
1·46	1·77	5·59	2 48	2·49	10·56	8·07	2·04	16·70	14 83	
2·47	3·00	.....	.....	.....	20·00	20·00	.....	.....	.....	1066
3·67	4·47	Trace.	1·66	17·91	19 57	19·57	0·00	5·00	28 54	
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1067
4·28	5·20	0·77	5·31	15·67	21·75	21·75	0 39	5·32	33 11	
2·06	2·50	5·00	3·00	2·00	10 06	8·00	1·50	.....	16 42	1068
2·44	2·96	8·15	1·13	1·16	10·44	9·28	1·77	12·56	19 09	
2·06	2 50	5·00	3·00	2·00	10·00	8·00	3·00	.....	17 99	1069
2·24	2·72	6·62	2·91	3·10	12·63	9·53	4·52	10·93	22 28	
2·47	3·00	.....	.....	.....	20·00	20·00	.....	.....	.....	1070
3·42	4·15	.....	7·34	16·76	24 10	24·10	.....	5·15	33 04	
1·03	1·25	7·00	1·00	1·00	9·00	8 00	2·00	.....	14 37	1071
1·30	1·57	6·16	1·84	2·30	10·30	8·00	2·10	16·85	15 34	
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1072
4·66	5·66	0·45	8·05	11·65	20·15	20·15	0·50	4·12	32 74	
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1073
7·14	8·67	0·45	3·52	7·04	11·01	11·01	0·50	5·38	24 19	
.....	.....	.....	.....	.....	.....	8·00	.....	.....	.....	1074
.....	.....	7·36	3·84	3·00	14·20	11·20	.....	13·00	13 95	
.....	4·00	.....	.....	.....	.....	9·00	5·00	.....	.....	1075
4·27	5·19	8·96	2·24	1·60	12·80	11·20	6·68	7·62	30 95	

TABLE I.—Statement of the Results of Examining 107 Standard

No. of Sample.	Name of Manufacturer.	By whom sent.	From what Materials produced.	Name or Brand of Fertilizer.
1076	The Nichols Chemical Co., Capelton, Que.	Manufacturers		'The Victor'— Guaranteed. Found
1077				'The Reliance'— Guaranteed. Found
1078				'No. 1 Brand'— Guaranteed. Found
1079				'Our Crown Brand'— Guaranteed. Found
1080	The W. A. Freeman Co., Ltd., 57 Ferguson Ave., South Hamilton, Ont.			'Freeman's Pure Bone'— Guaranteed. Found
1081				'Freeman's Sure Growth Manure'— Guaranteed. Found
1082				'Freeman's Potato Manure'— Guaranteed. Found
1083				'Freeman's Bone and Potash'— Guaranteed. Found
1084				'Freeman's Celery and Early Vegetable Manure'— Guaranteed. Found
1085				'Freeman's Grass and Grain Manure' Guaranteed. Found
1086				'Freeman's Tankage Manure'— Guaranteed. Found
1087				'Freeman's Tobacco Manure'— Guaranteed. Found
1088	The Standard Fertilizer & Chemical Co., Ltd., Smith's Falls, Ont.		Made from apatite and bone charcoal.	'Superphosphate of Lime'— Guaranteed. Found
1089			Made from nitrate of soda, sulphate of ammonia, potash and magnesia salts, mineral superphosphates, bone char and fine bone meal.	'Special Fertilizer'— Guaranteed. Found
1090				'No. 1 Fertilizer'— Guaranteed. Found
1091				'Standard Fertilizer'— Guaranteed. Found
1092				'Corn and Grass Fertilizer'— Guaranteed. Found
1093				'Royal Fertilizer'— Guaranteed. Found

SESSIONAL PAPER No. 14

Samples of Commercial Fertilizers registered for 1900—*Continued.*

Results of Analysis.										
Nitrogen.		Phosphoric Acid.					Potash.	Moisture.	Relative value per ton of 2,000 lbs.	No. of Sample.
Total, including that of Nitric Acid or Ammonia if present.	Total calculated as Ammonia.	Soluble in Water.	Reverted or Citrate Soluble.	Insoluble.	Total.	Total Available.				
p. c.	p. c.	p. c.	p. c.	p. c.	p. c.	p. c.	p. c.	p. c.	$ cts.	
.....	2·00	.....	.....	.....	.....	7·00	3·00	.....	.....	1076
2·83	3·43	6·23	3·37	2·24	11·84	9·60	3·94	11·27	22 78	
.....	2·00	.....	.....	.....	.....	6·00	2·00	.....	.....	1077
2·67	3·25	4·63	4·33	4·48	13·44	8·96	2·70	9·35	20 91	
.....	.....	.....	.....	.....	.....	11·50	.....	.....	.....	1078
.....	.....	10·70	3·82	2·24	16·76	14·52	.....	11·76	17 71	
.....	2·00	.....	.....	.....	.....	11·00	2·50	.....	.....	1079
2·77	3·37	9·75	3·05	1·60	14·40	12·80	3·63	10·34	26 00	
.....	3·00	.....	.....	.....	23·00	23·00	.....	.....	.....	1080
2·90	3·52	.....	7·84	16·88	24·72	24·72	.....	5·27	32 46	
.....	3·50	.....	.....	.....	8·00	.....	3·00	.....	.....	1081
4·52	5·48	6·05	1·87	3·20	11·12	7·92	3·98	4 84	25 31	
.....	3·00	.....	.....	.....	8·00	.....	5·00	.....	.....	1082
3·96	4·81	5·44	2·51	2·18	10·13	7·95	6·14	4·51	25 89	
.....	2·00	.....	.....	.....	9·00	.....	6·00	.....	.....	1083
4·14	5·03	5·24	2·13	2·22	9·59	7·37	8·66	3·43	28 43	
.....	6·00	.....	.....	.....	9·00	.....	6·00	.....	.....	1084
6·28	7·63	5·10	1·82	2·50	9·42	6·92	8·17	4·55	32 52	
.....	2·00	.....	.....	.....	9·00	.....	1·00	.....	.....	1085
3·61	4·38	4·52	1·53	2·52	8·57	6·05	3·26	4·10	19 94	
.....	5·00	.....	.....	.....	12·00	.....	.....	.....	.....	1086
6·92	8·40	.....	6·38	5·67	12·05	12·05	.....	9·41	29 30	
.....	6·00	.....	.....	.....	7·00	.....	7·00	.....	.....	1087
6·41	7·78	4·57	2·04	2·12	8·73	6·61	7·53	4·76	31 65	
.....	.....	.....	.....	.....	14·00	12·00	.....	.....	.....	1088
.....	.....	6·80	1·10	14·50	22 40	7·90	.....	9·90	13 72	
.....	3·50	.....	.....	.....	10·00	8·00	6·60	.....	.....	1089
2·80	3·40	5·00	0·91	9·06	14·97	5·91	8·07	9·30	24 99	
.....	1·50	.....	.....	.....	12·00	9·00	1·00	.....	.....	1090
1·24	1·50	5·75	1·03	12·54	19·32	6·78	1·48	12·00	16 42	
.....	2·50	.....	.....	.....	11·00	9·00	2·00	.....	.....	1091
2·59	3·15	5·75	0·77	12·28	18·80	6·52	2·58	10·90	20 34	
.....	2·00	.....	.....	.....	9·00	7·00	4·00	.....	.....	1092
2·35	2·85	5·90	1·13	11·26	18·29	7·03	3·80	11·00	21 33	
.....	2·00	.....	.....	.....	.....	8·00	3·00	.....	.....	1093
1·91	2·31	6·07	.....	12·73	18·80	6·07	3·55	10·50	19 41	

TABLE I.—Statement of the Results of Examining 107 Standard

Number of Sample.	Name of Manufacturer.	By whom sent.	From what Materials Produced.	Name or Brand of Fertilizer.
1094	The Standard Fertilizer & Chemical Co., Ltd., Smith's Falls, Ont.	Manufacturers		'Bone Meal'— Guaranteed Found
1095	" "	"		'Nitrate of Soda'— Guaranteed Found
1096	Bowker Fertilizer Co., 43 Chatham St., Boston, Mass.	"		'Bowker's Ground Bone'— Guaranteed Found
1097	" "	"		'Bowker's Potash Bone Fertilizer'— Guaranteed Found
1098	" "	"		'Bowkers' Vermont Fertilizer'— Guaranteed Found
1099	" "	"	Made from bone, bone black, phosphatic guano, bone phosphates, dried blood, meat or fish, sulphate of ammonia or nitrate of soda, sulphate of potash or muriate of potash and sulphuric acid.	'Bowkers' Square Brand Bone and Potash Fertilizer'— Guaranteed Found
1100	" "	"		'Bowkers' Farm and Garden Fertilizer'— Guaranteed Found
1101	" "	"		'Bowkers' Potash and Vegetable Fertilizer'— Guaranteed Found
1102	" "	"		'Stockbridge Potato and Vegetable Fertilizer'— Guaranteed Found
1103	Lowell Fertilizer Co., 44 North Market St., Boston, Mass.	"	Animal matter, high grade super-phosphate, muriate of potash, and high grade sulphate of potash	'Swifts' Lowell Bone Fertilizer'— Guaranteed Found
1104	" "	"		'Swifts' Lowell Animal Fertilizer'— Guaranteed Found
1105	" "	"		'Swifts' Lowell Potato Phosphate'— Guaranteed Found
1106	" "	"		'Swifts' Lowell Potato Manure'— Guaranteed Found
1107	" "	"		'Swifts' Lowell Ground Bone'— Guaranteed. Found
1108	Provincial Chemical Fertilizer Company, St. John, N.B.	"		'Imperial Superphosphate'— Guaranteed Found
1109	" "	"		'Potato Phosphate'— Guaranteed Found
1110	" "	"		'Victor Guano' Guaranteed Found
1111	" "	"		'Fruit Tree Fertilizer'— Guaranteed. Found

Samples of Commercial Fertilizers, registered for 1900.

Results of Analysis.										
Nitrogen.		Phosphoric Acid.					Potash.	Moisture.	Relative Value per Ton of 2,000 lbs.	Number of Sample.
Total, including that of Nitric Acid or Ammonia, if present.	Total Calculated as Ammonia.	Soluble in Water.	Reverted or Citrate, Soluble.	Insoluble.	Total.	Total Available.				
p. c.	p. c.	p. c.	p. c.	p. c.	p. c.	p. c.	p. c.	p. c.	$ cts.	
.....	5·00	.....	.....	.....	.....	20·00	.....	.....	.....	1094
4·12	5·00	.....	6·14	17·78	23·92	23·92	.....	6·00	34 42	
.....	19·00	.....	.....	.....	.....	.....	.....	.....	.....	1095
15·80	19·20	.....	.....	.....	.....	.....	.....	.....	41 08	
.....	3·00	.....	.....	.....	24·00	24·00	.....	.....	.....	1096
2·84	3·45	0·77	4·16	19·19	24·12	24·12	0·62	4·14	32 16	
.....	2·00	5·00	.....	.....	7·00	5·00	2·00	.....	.....	1097
0·98	1·20	3·01	4·16	2·56	9·73	7·17	2·34	5·20	14 97	
.....	2·50	8·00	.....	.....	10·00	8·00	3·00	.....	.....	1098
1·92	2·33	6·40	2·43	3·65	12·48	8·83	3·24	11·34	19 40	
.....	2·06	6·00	.....	.....	12·00	6·00	2 00	.....	.....	1099
1·92	2·33	4.61	3·08	6·21	13·90	7·69	2·41	8·26	17 92	
.....	2·00	8·00	.....	.....	10·00	8·00	2·00	.....	.....	1100
1·68	2·04	6·21	3·58	3·01	12.80	9·79	2·49	13·96	18 93	
.....	2·00	9·00	.....	.....	11·00	9·00	2·00	.....	.....	1101
1·78	2·16	8·96	1·60	2·24	12·80	11.20	2·72	14·20	20 31	
.....	4·00	6·00	.....	.....	7·00	6·00	10·00	.....	.....	1102
3·26	3·96	2·69	4·99	1·28	8·96	7·68	10·99	10·16	28 47	
.....	2·00	.....	.....	.....	.....	8.00	3·00	.....	.....	1103
1·66	2·02	4·48	4·49	0·63	9·60	8·97	3·29	7·44	17 94	
.....	3·00	.....	.....	.....	.....	9·00	4·00	.....	.....	1104
2·35	2·86	5·43	3·85	2·07	11·35	9·28	4·90	8·84	22 15	
.....	3·00	.....	.....	.....	.....	8·00	6·00	.....	.....	1105
2·35	2·86	2·56	5 59	1·12	9·27	8·15	8·00	4 96	23 60	
.....	2·00	.....	.....	.....	.....	7·00	4·00	.....	.....	1106
1·57	1·90	3·84	3·20	1 11	8·15	7·04	4·34	4·52	16 79	
.....	3·00	.....	.....	.....	25·00	25·00	.....	.....	.....	1107
2·46	2·99	0·47	12·48	14·55	27·50	27·50	.....	3·60	34 74	
2·48	3·01	4·50	.....	.....	14·10	9·98	1·88	.....	.....	1108
2·34	2·84	6·39	1·34	6·34	14·07	7·73	1·80	14·12	18 55	
2·66	3·23	5·21	.....	.....	14·18	9·05	5·63	.....	.....	1109
2·60	3·16	6·56	3·52	3·83	13·91	10 98	5·78	13 44	25 20	
2·00	2·43	4·74	.....	.....	14·89	6·97	2·5	.....	.....	1110
2·24	2·72	7·99	3·20	3·52	14·71	11·19	0·85	13·68	20 43	
2·59	3·15	4·02	.....	.....	14·54	8·69	5·83	.....	.....	1111
2·64	3·21	6·70	3·54	3·83	14·07	10·24	4·60	13·88	24 25	

TABLE I.—Statement of the Results of Examining 107 Standard

No. of Sample.	Name of Manufacturer.	By whom sent.	From what Material Produced.	Name or Brand of Fertilizer.
1112	Provincial Chemical Fertilizer Company St. John, N.B.	Manufacturers		'Bone Meal'— Guaranteed Found
1113	" "	W. Harris & Co. Danforth Avenue, Toronto.		'Nitrate of Soda'— Guaranteed Found
1114	Thos. Reid, St. John, N.B.	Manufacturers		'Reid's Superphosphate'— Guaranteed Found
1115	B. & M. Rattenbury, Charlottetown, P.E.I.	"	Blood, bones and tankage.	'No. 1 Fertilizer'— Guaranteed Found
1116	" "	"	Blood, bones & tankage mixed with nitrate of soda & potash	'No. 2 Fertilizer'— Guaranteed Found
1117	" "	"		'Bone Meal'— Guaranteed Found
1118	Packers Union Fertilizer Company, New York.	"		'Wheat, Oats & Clover Fertilizer'— Guaranteed Found
1119	" "	"		'Economical Vegetable Guano'— Guaranteed Found
1120	" "	"		'Universal Fertilizer.'— Guaranteed Found
1121	" "	"		'Animal Corn Fertilizer'— Guaranteed Found
1122	" "	"		'High Grade Potato Manure'— Guaranteed Found
1123	The Nova Scotia Fertilizer Company, Halifax, N.S.	"	The bone phosphate, potash & ammonia, are obtained from bone, muriate of potash, kainite and animal matter, such as tankage. The bone phosphate being made soluble by the addition of sulphuric acid.	'Ceres Superphosphate'— Guaranteed Found
1124	" "	"		'Potato Phosphate'— Guaranteed Found
1125	" "	"		'Apple Tree Phosphate'— Guaranteed Found
1126	" "	"		'Strawberry Phosphate'— Guaranteed Found
1127	" "	"		'Bone Meal'— Guaranteed Found
1128		Wallace & Fraser, 90 Germain St., St. John N.B.		'Thomas' Phosphate Powder'— Guaranteed Found
1129	Albert Manufacturing Co., Hillsborough, N.B.	Manufacturers		'Potato Fertilizer'— Guaranteed Found
	" "	"		'Grass Fertilizer'— Guaranteed Found

Samples of Commercial Fertilizers Registered for 1900—*Continued.*

Results of Analysis.										
Nitrogen.		Phosphoric Acid.				Potash.	Moisture.	Relative Value per ton of 2,000 lbs.	No. of Sample.
Total, including that of Nitric Acid or Ammonia, if present.	Total calculated as Ammonia.	Soluble in Water.	Reverted or Citrate, Soluble.	Insoluble.	Total.	Total, Available.				
p. c.	p. c.	p. c.	p. c.	p. c.	p. c.	p. c.	p. c.	p. c.	$ cts.	
3·57	4·34	.....	.....	.....	24·42	24·42	.....	.....	.....	1112
3·47	4·22	0·32	14·24	9·91	24·47	24·47	.....	6·88	34 28	
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1113
15·82	19·21	.....	.....	.....	.....	.....	.....	0·24	41 13	
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1114
3·71	4·51	1·22	5.21	4·27	10·70	6·43	1·69	8·06	19 14	
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1115
4·89	5·93	0·79	1·34	6·85	8·98	8·98	0.66	25·02	21 70	
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1116
4·87	5·91	0·58	6·21	5·05	11·84	11·84	6·53	8·82	31 13	
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1117
1·69	2·06	0·51	0·38	17·09	17·98	17·98	0·56	2·66	22 77	
.....	.....	9·00	2·00	1·00	12·00	11·00	2·00	.....	.....	1118
.....	.....	3·52	6·71	4·48	14·71	10·23	1·84	7·54	19 77	
1·25	1·50	4.50	1·50	1·00	7·00	6·00	3·00	.....	.....	1119
1·57	1·91	5·16	2.64	1·73	9·53	7·80	4·08	6·93	15 87	
0·82	1 06	6·00	2·00	1·00	9·00	8·00	4·00	.....	.....	1120
1·16	1·41	5·97	3·05	2·11	11·13	9·02	6·10	10·42	17 73	
2·47	3·00	6·00	2·00	1·00	9·00	8·00	2·00	.....	.....	1121
2·23	2·71	7·03	2·82	2·02	11·87	9.85	2·22	6·01	20 92	
2·05	2·50	6·00	2·00	1·00	9·00	8·00	6·00	.....	.....	1122
2·02	2·45	5·16	3·68	2·39	11·23	8·84	7·93	8·00	24 14	
.....	2·00	.....	.....	.....	.....	9·20	2·14	.....	.....	1123
2·51	3·05	4·15	3·73	2·99	10·87	10·87	2 64	10·94	18 77	
.....	3·71	.....	.....	.....	.....	7·80	4·70	.....	.....	1124
3·21	3·90	3·70	2·72	2·47	8·89	8·89	5·03	13·41	21 15	
.....	3·25	.....	.....	.....	.....	7·80	6·53	.....	.....	1125
3·16	3·84	3·69	3·02	2·51	9·22	9·22	5·71	10·53	22 08	
.....	2·02	.....	.....	.....	.....	8·30	6·50	.....	.....	1126
3·02	3·67	3·36	3·23	2·36	8·95	8·95	5·54	10·75	21 36	
.....	4·53	.....	.....	.....	.....	22·66	.....	.....	.....	1127
3·86	4·68	.....	7·95	13·46	21·41	21·41	.....	3·95	31 46	
.....	.....	.....	.....	.....	17·00	.....	.....	.....	.....	1128
.....	.....	0·16	6·74	11·10	18·00	6·90	.....	0·20	15 37	
.....	.....	.....	.....	.....	6·25	.....	0·51	.....	.....	1129
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	
.....	.....	.....	.....	.....	8·12	.....	0·44	.....	.....	1130
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	

TABLE I.—Statement of the Results of Examining 107 Standard

No. of Sample.	Name of Manufacturer.	By whom sent.	From what Materials produced.	Name or Brand of Fertilizer.
1131	Albert Manufacturing Co., Hillsborough, N.B.	Manufacturers		'Wheat Fertilizer'— Guaranteed. Found.
1132		Andrews, Bell & Co., Montreal.		'Basic Slag'— Guaranteed. Found.
1133	Pidgeon Fertilizer Co., Windsor, N.S.	Manufacturers		'Ground Bone'— Guaranteed. Found.
1134	" "	"	Phosphoric acid from animal bone. Ammonia from nitrate of soda and animal matter. Potash, muriate of potash.	'Eureka Phosphate'— Guaranteed. Found.
1135	" "			'Eureka Potato Manure'— Guaranteed. Found.
1136	" "			'Intense Brand' for all root crops— Guaranteed. Found.
1137	Parmenter & Polsey Fertilizer Co., Peabody, Mass.	"	Bone, animal tankage, potash and nitrate of soda.	'Star Brand'— Guaranteed. Found.
1138				'Plymouth Rock Brand'— Guaranteed. Found.
1139	Imported from Chili.	M. P. Morris, Vancouver, B.C.		'Nitrate of Soda'— Guaranteed. Found.
1140	" "	Victoria Chemical Co., Ltd., Victoria, B.C.		'Nitrate of Soda'— Guaranteed. Found.
1141	" "	"		'Kainite'— Guaranteed. Found.
1142				'Sulphate of Potash'— Guaranteed. Found.
1143	"	"		'Muriate of Potash'— Guaranteed. Found.
1144	The Victoria Chemical Co., Limited, Victoria, B.C.	Manufacturers	Treating spent bone char with sulphuric acid.	'Superphosphate'— Guaranteed. Found.
1145	" "	"	Nitrate of soda, kainite, superphosphate and sand.	'Mixed Fertilizer'— Guaranteed. Found.
1146		Wallace & Fraser, St. John, N.B.		'Thomas' Phosphate Powder'— Guaranteed. Found.
1147		"		'Thomas' Phosphate Powder'— Guaranteed. Found.

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Samples of Commercial Fertilizers registered for 1900.—*Concluded.*

Results of Analysis.										
Nitrogen.		Phosphoric Acid.					Potash.	Moisture.	Relative Value per ton of 2,000 lbs.	No. of Sample.
Total, including that of Nitric Acid or Ammonia if present.	Total calculated as Ammonia.	Soluble in Water.	Reverted or Citrate Soluble.	Insoluble.	Total.	Total available.				
p. c.	p. c.	p. c.	p. c.	p. c.	p. c.	p. c.	p. c.	p. c.	$ cts.	
.....	0·50	.....	.....	.....	8·41	.....	0·48	.....	.....	1131
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1132
.....	.....	0·30	2·69	12·24	15·23	2·99	.....	0·17	11 89	
.....	3·00	.....	.....	.....	.....	23·50	·01	.....	.....	1133
3·66	4·44	.....	7·75	14·83	22·58	22·58	.....	7·45	32 14	
.....	3·00	.....	.....	.....	.....	9·00	2·50	.....	.....	1134
2·95	3 58	3·47	3·22	4·24	10·93	10·93	4·44	13·76	23 68	
.....	4·00	.....	.....	.....	.....	8·00	5·00	.....	.....	1135
3·53	4·29	4·10	1·93	2·09	8·12	8·12	7·45	11·75	25 42	
.....	4·00	.....	.....	.....	.....	7·00	5·50	.....	.....	1136
3·69	4·48	3·48	2·01	2·05	7·54	7·54	8·52	12·27	26 25	
.....	1·14	2·50	.....	.....	8·00	7·00	.....	.....	.....	1137
1·61	1·95	5·95	2·87	1·60	9·52	9·52	3·07	8·81	17 90	
.....	2·47	4·00	.....	.....	9·00	8·00	.....	.....	.....	1138
2·54	3·08	3·45	3·13	2 20	8·78	8·78	3·19	7·70	19 23	
.....	19·00	.....	.....	.....	.....	.....	.....	.....	.....	1139
15·80	19·20	.....	.....	.....	.....	.....	.....	0·20	41 08	
.....	19·00	.....	.....	.....	.....	.....	.....	.....	.....	1140
15·25	18·52	.....	.....	.....	.....	.....	.....	0·39	39 65	
.....	.....	.....	.....	.....	.....	.....	12·00	.....	.....	1141
.....	.....	.....	.....	.....	.....	.....	13·21	5·75	13 87	
.....	.....	.....	.....	.....	.....	.....	50·00	.....	.....	1142
.....	.....	.....	.....	.....	.....	.....	49·63	2·63	52 11	
.....	.....	.....	.....	.....	.....	.....	50·00	.....	.....	1143
.....	.....	.....	.....	.....	.....	.....	53·04	1·98	55 69	
.....	.....	15·50	.....	.....	.....	.....	.....	.....	.....	1144
.....	.....	14·00	1·20	2·04	17·24	15·20	0·66	8·97	.....	
.....	2·20	5·00	.....	.....	.....	.....	2·80	.....	.....	1145
1·61	1·96	4·62	1·26	2·65	8·53	5·88	4·23	6·68	.....	
						Citric Soluble.				
.....	.....	.....	.....	.....	18·32	15·87	.....	.....	.....	1146
						Available.				
.....	.....	0·16	8·19	9·95	18·30	8·35	.....	.....	16 17	
						Citric Soluble.				
.....	.....	.....	.....	.....	18·18	15·87	.....	.....	.....	1147
						Available.				
.....	.....	0·23	6·60	10·77	17·60	6·83	.....	0·03	15 08	

TABLE II.—Results of the Examination of

Date of Collection.	No. of Sample.	Name and Address of Vendor.	Name and Address of Manufacturer or Furnisher as given by Vendor.	Name or Brand of Fertilizer.	Nitrogen. Total, including that of Nitric Acid or Ammonia if present.	Nitrogen. Total, calculated as Ammonia.
1900.		*Kentville, N.S.*	*Analyst, Dr. M. Fiset, Quebec.*		p. c.	p. c.
Apl. 26	16770	DeWolf & Lamont	Nova Scotia Fertilizer Co., Halifax.	'Ceres Superphosphate'—		
				Guaranteed		2·00
				Standard sample	2·51	3·05
		Wolfville, N.S.		Sample as sold	1·82	2·21
" 26	16771	Starr, Son & Franklin.	Cumberland Potato Fertilizer Co., Portland, Me.	'Potato Fertilizer'—		
				Guaranteed	2·06	2·50
				Standard sample	2·24	2·72
				Sample as sold	2·32	2·82
" 26	16772	Wolfville Coal Co.	Bowker Fertilizer Co., Boston, Mass.	'Farm and Garden'—		
				Guaranteed		2·00
				Standard sample	1·68	2·04
		Dartmouth, N.S.		Sample as sold	1·95	2·36
" 30	16773	E. M. Walker	Pacific Guano Co., Boston, Mass.	'Soluble Pacific Guano'—		
				Guaranteed	2·06	2·50
				Standard sample	2·38	2·88
				Sample as sold	2·60	3·18
" 30	16774	Colin McNab	Alberts' Thomas' Phosphate Co., London, Eng.	'Thomas' Phosphate Powder'—		
				Guaranteed		
				Standard sample		
		St. John, N.B.		Sample as sold	0·31	0·37
" 21	17706	Thos. Reid, Parish of Simonds.	Vendor	'Reid's Superphosphate'—		
				Guaranteed		
				Standard sample	3 71	4·51
				Sample as sold	3·77	4·57
" 23	17707	D. J. Seely & Son, 44 Britain St.	Bowker Fertilizer Co., Boston, Mass.	'Farm and Garden'—		
				Guaranteed		2·00
				Standard sample	1·68	2·04
				Sample as sold	2·02	2·45
" 24	17708	Wallace & Fraser, 3 Smyth St.	Chemical Works, late H. & E. Albert, London, Eng.	'Thomas' Phosphate Powder'—		
				Guaranteed		
				Standard sample		
		Fredericton, N.B.		Sample as sold	0·23	0·29
" 27	17709	W. T. Estey, Queen Street.	Parmenter & Polsey Fertilizer Co., Peabody, Mass.	'Plymouth Rock'—		
				Guaranteed		2·47
				Standard sample	2·54	3·08
				Sample as sold	2·97	3·66
" 27	17710	J. F. Vanbuskirk, Phœnix Square.	Provincial Chemical Fertilizer Co., St. John, N.B.	'Potato Phosphate'—		
				Guaranteed	2·66	3·23
				Standard sample	2·60	3·16
		Coaticook, Que.		Sample as sold	1·46	1·77
" 2	19676	C. E. Baldwin, Farmer.	Read Fertilizer Co., N.Y.	'Leader Guano'—		
				Guaranteed		
				Standard sample		
				Sample as sold	1·22	1·48

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59 Samples of Fertilizers as sold in 1900.

Results of Analysis.									
Phosphoric Acid.									
Soluble in Water.	Reverted or Citrate soluble.	Insoluble.	Total.	Total Available.	Potash.	Moisture.	Relative value per ton of 2,000 lbs	No. of Sample.	Official Analyst's Remarks.
p. c.	p. c.	p. c.	p. c.	p. c.	p. c.	p. c.	$ cts.		
.....	.....	.....	.....	9·20	2·14	.....	.....	16770	
4·15	3·73	2·99	10·87	10·87	2·64	10·94	18 77		
3·04	3·52	2·87	9·43	9·43	3·00	18·52	17 91	.....	Genuine—up to guarantee.
5·00	3·00	2·00	10·00	8·00	3·00	.....	17 99	16771	
6·62	2·91	3·10	12·63	9·53	4·52	10 93	22 28		
7·04	4·01	1·91	12·96	11·05	3·21	14·44	22 57	.....	" " .
8·00	.....	.....	10·00	8·00	2·00	.....	.....	16772	
6·21	3·58	3·01	12·80	9·79	2·49	13·96	18 93		
4·80	4·32	2·23	11·35	9·12	1·83	12·40	17 78	.....	" " .
5·00	3·00	2.00	10 00	8·00	1·50	.....	16 42	16773	
8·15	1·83	2·24	12·22	9·98	1·50	12·05	19 78		
7·03	2·73	1·75	11·51	9·76	1·73	18·64	20 03	.....	" " .
.....	.....	.....	17·00	.....	.....	.....	.....	16774	
0·23	6·60	10·77	17·60	6 83	.....	.....	15 08		
0·80	6·82	5·49	13·11	7·62	.....	0·04	13 04	.....	Adulterated being below guarantee, in total phosphoric Acid.
.....	.....	.....	.....	.....	.....	.....	.....	17706	
1·22	5·21	4·27	10·70	6·43	1·69	8·06	19 14		
1·44	7·84	3·35	12·63	9·28	1·53	24·32	22 02	.....	No guarantee given.
8·00	.....	.....	10·00	8 00	2·00	.....	.....	17707	
6·21	3·58	3·01	12·80	9·79	2·49	13·96	18 93		
5·60	3·36	1·75	10·71	8·96	2·42	13·68	18 34	.....	Genuine—up to guarantee.
.....	.....	.....	17·00	.....	.....	.....	.....	17708	
0·23	6·60	10·77	17·60	6·83	.....	.....	15 08		
0·96	4·85	7·00	12·81	5·81	.....	.....	11 94	.....	Adulterated, being below guarantee, in total phosphoric Acid.
4·00	.....	.....	9·00	8·00	.....	.....	.....	17709	
3·45	3·13	2·20	8·78	8·78	3·19	7·90	19 23		
6·56	2·71	1·44	10·71	9·27	4·11	7·00	22 73	.....	Genuine and up to guarantee.
5·21	.....	.....	14·18	9·05	5·63	.....	.....	17710	
6·56	3·52	3·83	13·91	10·08	5 78	13·44	25 20		
8·31	3·37	2·07	13·75	11·68	4·57	14·36	22 60	.....	Genuine, but below guarantee in Ammonia and potash.
.....	... ..	Not registered for 1900.			.....	.....	.....	19676	
.....	.....	.....	.....	.....	.....	.....	.....		
4·80	4·57	1·43	10·80	9·37	1·73	14·56	15 97	.....	No guarantee given.

TABLE II.—Results of the Examination of 59

Date of Collection.	No. of Sample.	Name and Address of Vendor.	Name and Address of Manufacturer or Furnisher as given by Vendor.	Name or Brand of Fertilizer.	Nitrogen. Total including that of Nitric Acid or Ammonia if present.	Nitrogen. Total calculated as Ammonia.
1900.		*Coaticooke*—Con.	*Analyst, Dr. M. Fiset.*		p. c.	p. c.
April 2	19677	C. E. Baldwin, Farmer.	Read Fertilizer Co., N.Y.	'Standard Superphosphate'—		
				Guaranteed		
				Standard sample		
				Sample as sold	0·90	1·09
" 2	19678	"	"	'Potato Special'—		
				Guaranteed		
				Standard sample		
		Sherbrooke, Que.		Sample as sold	1·27	1·55
" 2	19679	C. N. Genest, King Street.	Wallace & Fraser, St. John, N.B.	'Thomas Phosphate Powder'—		
				Guaranteed		
				Standard sample		
				Sample as sold	0·24	0·29
" 2	19680	Coderre Fils & Co., Wellington St.	Pacific Guano Co., Boston, Mass.	'Soluble Pacific Guano'—		
				Guaranteed	2·06	2·50
				Standard sample	2·38	2·88
				Sample as sold	2·06	2·50
		Quebec.				
" 10	19681	P. T. Legare, St. Paul St.	Nichols Chemical Co., Capelton, Que.	'No. 1 Superphosphate'—		
				Guaranteed		
				Standard sample		
				Sample as sold	0·07	0·09
" 10	19682	"	"	'Royal Canadian'—		
				Guaranteed		4·00
				Standard sample	4·27	5·19
				Sample as sold	3·01	3·66
" 10	19683	"	"	'Capelton Superphosphate'—		
				Guaranteed		
				Standard sample		
				Sample as sold	0·24	0·29
" 10	19684	"	"	'Reliance'—		
				Guaranteed		2·00
				Standard sample	2·67	3·25
		St. Armand W., Que.		Sample as sold	0·97	1·17
" 6	19688	J. E. Primerman, Farmer.	Bradley Fertilizer Co., Boston, Mass.	'Potato Fertilizer'—		
				Guaranteed	2·06	2·50
				Standard sample	2·06	2·50
				Sample as sold	2·10	2·55
6	19689	"	"	'XL Superphosphate'—		
				Guaranteed	2·07	2·50
				Standard sample	2·29	2·79
				Sample as sold	2·43	2·96

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Samples of Fertilizers as sold in 1900—*Continued.*

Results of Analysis.									
Phosphoric Acid.									
Soluble in Water.	Reverted or Citrate soluble.	Insoluble.	Total.	Total Available.	Potash.	Moisture.	Relative value per ton of 2,000 lbs	No. of Sample.	Official Analyst's Remarks.
p. c.	p. c.	p. c.	p. c.	p. c.	p. c.	p. c.	$ cts.		
.....	.....	Not registered for 1900.			.....	.....	.....	19677	
7·20	2·23	1·27	10·70	9·43	4·20	14·04	18 04	.....	No guarantee given.
.....	.....	Not registered for 1900.			.....	.....	.....	19678	
2·56	2·57	2·55	7·68	5·13	8·34	9·40	18 47	.....	" "
.....	.....	.....	17·00	.....	.....	.....	.....	19679	
0·23	6·60	10·77	17·60	6·83	.....	.....	15 08		
0·64	2 09	7·19	9·92	2·73	Trace.	0·24	8 69	.....	Below guarantee in phosphoric acid; and adulterated under the Act.
5 00	3·00	2·00	10·00	8·00	1·50	.....	16 42	19680	
8·15	1·83	2·24	12·22	9·98	1·50	12·05	19 78		
3·84	5·73	3·03	12·60	9·57	2·87	12·12	19 79	.....	Genuine and up to guarantee.
.....	.....	.....	.....	11·50	.....	.....	.....	19681	
10·70	3·82	2·24	16·76	14·52	.....	11·76	17 71		
9·59	6·25	2·71	18·55	15·84	0·72	12·88	20 12	.....	" "
.....	.....	.....	.....	9·00	5·00	.....	.....	19682	
8·96	2·24	1·60	12·80	11·20	6·68	7·62	30 95		
8·31	3·69	1·27	13·27	12·00	4·72	11·24	26 59	.....	Genuine, but below guarantee in ammonia.
.....	.....	.....	.....	8·00	.....	.....	.....	19683	
7·36	3·84	3·00	14·20	11·20	.....	13·00	13 95		
7·52	4·80	1·75	14·07	12·32	0·30	13·08	15 73	.....	Genuine and up to guarantee.
.....	.....	.....	.....	6·00	2·00	.....	.....	19684	
4·63	4·33	4·48	13·44	8·96	2·70	9·35	20 91		
7·51	4·65	2·07	14·23	12·16	1·42	13·20	18 58	.....	Genuine, but below guarantee in ammonia.
5·00	3·00	2·00	10·00	8·00	3·00	.....	17 99	19688	
6·08	4·47	3·01	13·56	10·55	3·57	10·98	21 81		
6·56	3·24	1·76	11·56	9·80	3·00	15·80	20 15	.....	Genuine and up to guarantee.
8·00	.....	.....	10·00	.....	1·00	.....	.....	19689	
5·95	4·02	3·01	12·98	9·97	2·49	13·20	20 58		
7·68	3·84	1·91	13·43	11·52	2·32	16·04	22 22	.....	" "

TABLE II.—Results of the examination of 59

Date of Collection.	No. of Sample.	Name and Address of Vendor.	Name and Address of Manufacturer or Furnisher as given by Vendor.	Name or Brand of Fertilizer.	Nitrogen. Total, including that of Nitric Acid or Ammonia if present.	Nitrogen. Total, calculated as Ammonia.
1900.		*Bedford, P.Q.*	*Analyst, Prof. E. B. Kenrick, Winnipeg.*		p. c.	p. c.
April 6	19690	E. T. Currie	Nicholls Chemical Co., Capelton, P.Q.	'Victor Guano'		
				Guaranteed	.....	2·00
				Standard sample.....	2·83	3·43
				Sample as sold.....	1·62	1·97
" 6	19691	"	" "	'Reliance'—		
				Guaranteed	.....	2·00
				Standard sample.....	2·67	3·25
				Sample as sold.....	2·31	2·84
		Montreal.				
" 12	19692	Brodie & Harvie, 8 Bleury St.	Standard Fertilizer Co., Smith's Falls.	'Standard'—		
				Guaranteed	.....	2·50
				Standard sample.....	2·59	3·15
				Sample as sold.....	2·49	3·02
" 12	19693	" "	" "	'Special'—		
				Guaranteed	.....	3·50
				Standard sample.....	2·80	3·40
				Sample as sold.....	3·06	3·72
" 16	19694	Laing Packing Co., 82 Catherine St.	Vendors.....	'Tankage'—		
				Guaranteed	4·12	5·00
				Standard sample.....	5·12	6·22
				Sample as sold.....	3·74	4·54
		Sutton, P.Q.				
" 17	19695	A. A. Robinson...	Read Fertilizer Co..	'Leader Guano'—		
				Guaranteed	.....	Not
				Standard sample.....	.....	.....
				Sample as sold.....	1·01	1·23
" 17	19696	" ...	" " ..	'Fish, Bone and Potash'—		
				Guaranteed	.....	Not
				Standard sample.....	.....	.....
				Sample as sold.....	2·49	3·02
" 17	19697	C. O. Smith . ..	Pacific Guano Co., Boston, Mass.	'Potato Special'—		
				Guaranteed	2·06	2·50
				Standard sample.....	2·35	2·85
				Sample as sold.....	2·21	2·68
" 17	19698	Greeley Bros. & Thompson.	Standard Fertilizer Co., Smith's Falls.	'No. 1 Fertilizer'—		
				Guaranteed	.....	1·50
				Standard sample.....	1·24	1·50
				Sample as sold.....	1·50	1·82
" 17	19699	C. O. Smith	Pacific Guano Co., Boston, Mass.	'Nobsque Guano'—		
				Guaranteed	1·03	1·25
				Standard sample...	1·46	1·77
				Sample as sold.....	1·42	1·72

SESSIONAL PAPER No. 14

Samples of Fertilizers as sold in 1900—*Continued.*

Results of Analysis.									
Phosphoric Acid.									
Soluble in Water.	Reverted or Citrate soluble.	Insoluble.	Total.	Total Available.	Potash.	Moisture.	Relative value per ton of 2,000 lbs	No. of Sample.	Official Analyst's Remarks.
p. c.	p. c.	p. c.	p. c.	p. c.	p. c.	p. c.	$ cts.		
...	...	...	...	7·00	3·00	...	...	19690	
6·23	3·37	2·24	11·84	9·60	3·94	11·27	22 78		
5·78	1·53	4·52	11·83	7·31	3·52	12·56	17 67		Genuine.
...	...	...	...	6·00	2·00	...	...	19691	
4·63	4 33	4·48	13.44	8·96	2·70	9·35	20 91		
4·37	1·52	3·70	9·59	5·89	2·38	11·15	16 09		"
...	...	...	11·00	9·00	2·00	...	...	19692	
5·75	0·77	12·28	18·80	6·52	2·58	10·90	20 34		
8·38	1·84	4·26	14·48	10·22	2·51	14·61	21 97		"
...	...	...	10·00	8·00	6·00	...	...	19693	
5·00	0·91	9·06	14·07	5·91	8·07	9·30	24 99		
6·83	1.18	4·08	12·09	8·01	7·30	8·15	25 37		"
...	...	...	14·71	...	...	5·52	...	19694	
0·77	7·46	9·56	17·79	17·79	0·42	7·48	31 43		
trace.	7·76	12·66	20·42	20·42	...	12·68	30 18		Below guarantee in nitrogen, above in phosphoric acid.
registered for 1900. ...	...	...	...	...	...	...	...	19695	
...	...	...	...	...	...	...	...		
4·28	2·56	1·05	7·89	6·84	2·21	14·80	13 01		Not guaranteed.
registered for 1900. ...	...	...	...	...	...	...	...	19696	
...	...	...	...	...	...	...	...		
3·07	1·30	2·53	6·90	4·37	5·08	9·93	18 95		"
6·00	2·00	1·00	9·00	8·00	3·00	...	17 79	19697	
6·29	3·11	4·03	13·43	9·40	2·74	10·70	20 70		
6·22	3·24	2·03	11·49	9·46	3·47	16·62	20 57		Genuine.
...	...	...	12·00	9·00	1·00	...	...	19698	
5·75	1·03	12·54	19·32	6·78	1·48	12·00	16 42		
8·25	1·04	4·37	13·66	9·29	1·56	17·96	17 59		"
5·00	3·00	1·00	9·00	8·00	2 00	...	14 17	19699	
5·59	2·48	2·49	10·56	8·07	2·04	16·70	14 83		
5·42	2·18	1·83	9·43	7·60	2·77	16·32	15 77		"

TABLE II.—Results of the Examination of 59

Date of Collection.	No. of Sample.	Name and Address of Vendor.	Name and Address of Manufacturer or Furnisher as given by Vendor.	Name or Brand of Fertilizer.	Nitrogen. Total, including that of Nitric Acid or Ammonia if present.	Nitrogen. Total, calculated as Ammonia.
1900.		*Ottawa.*	*Analyst, Dr. F. X. Valade, Ottawa.*		p. c.	p. c.
April 4	20680	Graham Bros., florists, &c.	W. A. Freeman Co., Hamilton Co.	'Potato Manure'—		
				Guaranteed ..	.....	3·00
				Standard sample.....	3·96	4·81
				Sample as sold..	2·10	2·55
" 4	20681	" "	" "	'Tankage'—		
				Guaranteed	.....	5·00
				Standard sample.....	6·92	8·40
		Brockville, Ont.		Sample as sold	4·62	5·61
" 5	20682	H. Brown & Sons.	Bradley, Fertilizer Co., Boston, Mass.	'Bradley's Potato Fertilizer'—		
				Guaranteed	2·06	2.50
				Standard sample.....	2 06	2·50
				Sample as sold..	1·68	2·04
" 5	20683	" "	" "	'Bradley's Complete Manure for Potatoes and Vegetables'		
				Guaranteed		From
				Standard sample.....	.....	....
				Sample as sold..	2·38	2·89
" 5	20684	" "	" "	'Bradley's Dissolved Bone with Potash'—		
				Guaranteed	0·82	1·00
				Standard sample.....	1·43	1·73
				Sample as sold.....	0·84	1·02
		Smith's Falls, Ont.				
" 5	20686	The Standard Fertilizer and Chemical Co.	Vendors	'Special Fertilizer'—		
				Guaranteed	.....	3·50
				Standard sample.....	2·80	3·45
				Sample as sold....	2·80	3·46
" 5	20687	" "	"	'No. 1 Fertilizer'—		
				Guaranteed	.....	1·50
				Standard sample.....	1·24	1·50
				Sample as sold..	1·47	1·79
" 5	20688	" "	"	'Standard Fertilizer'—		
				Guaranteed	.....	2·50
				Standard sample.....	2·59	3·15
				Sample as sold..... . ..	2·03	2·47
" 5	20689	Standard Fertilizer and Chemical Company.	Vendors.....	'Corn and Grass Fertilizer'—		
				Guaranteed	.....	2·00
				Standard sample.....	2·35	2·85
				Sample as sold.	2·28	2·75
" 5	20690	" ...	"	'Royal'—		
				Guaranteed	.....	2·00
				Standard sample.....	1·91	2·31
				Sample as sold.....	2·64	3·20

Samples of Fertilizers as sold in 1900—*Continued*..

Results of Analysis.									
Phosphoric Acid.									
Soluble in Water.	Reverted or Citrate soluble.	Insoluble.	Total.	Total Available.	Potash.	Moisture.	Relative value per ton of 2,000 lb.	No. of Sample.	Official Analyst's Remarks.
p. c.	p. c.	p. c.	p. c.	p. c.	p. c.	p. c.	$ cts.		
.....	.....	.....	8·00	.....	5·00	.....	.....	20680	
5·44	2·51	2·18	10·13	7·95	6·14	4·51	25 89		
5·96	0·92	3·60	10·48	6·88	5·00	4·41	19 53	.....	Slightly below guarantee in ammonia.
.....	.....	.....	12·00	.....	.....	.....	.....	20681	
.....	6·38	5·67	12·05	12·05	.....	9·41	29 30		
0·89	4·40	6·16	11·45	11·45	0·73	8·81	23 93	.....	Genuine.
5·00	3·00	2.00	10·00	8·00	3·00	.....	17 99	20682	
6·08	4·47	3·01	13·56	10·55	3·57	10·98	21 81		
6·14	2·27	1·90	10·31	8·41	3·28	17·02	17 91	.....	Up to guarantee.
last year's stock.		Not registered this year.		.....	.....	.....	.....	20683	
.....	.....	.....	.....	.....	.....	.....	.....		
2·98	3·69	4·01	10·68	6·67	6·92	12·56	21 82	.....	Not guaranteed.
5·00	3·00	2·00	10·00	8·00	2·15	.....	15 03	20684	
5·60	2·88	1·92	10·40	8·48	2·21	18·20	16 22		
4·55	2·98	2·99	10·52	7·53	2·33	13·38	14 11	.. . .	Up to guarantee.
.....	.....	...	10·00	8·00	6·00	.....	.....	20686	
5·00	0·91	9·06	14·97	5·91	8·07	9·30	24 99		
5·96	1·49	4·56	12·01	7·45	7·75	9·04	25 02	.....	"
.....	.....	.....	12·00	9·00	1·00	.....	.....	20687	
5·75	1·03	12·54	19·32	6 78	1·48	12·00	16 42		
4·96	1·14	8·14	14·24	6·10	1·51	13·37	14 76	.....	Below guarantee in available phosphoric acid. Adulterated.
.....	.....	.....	11·00	9·00	2·00	.....	.....	20688	
5·75	0·77	12·28	18·80	6·52	2·58	10·90	20 34		
7·95	0·71	6·96	15·62	8·68	2·18	11·38	19 57	.. ...	Up to guarantee.
.....	.....	.....	9·00	7·00	4·00	.....	.....	20689	
5·90	1·13	11 26	18·29	7·03	3·80	11·00	21 33		
9·27	0·90	7·48	17·65	10·17	4·57	10·90	24 62	.. ..	Up to standard and guarantee.
.....	.....	.....	.....	8·00	3·00	.. ..	.....	20690	
6·07	.....	12·73	18·80	6·07	3·55	10·50	19 41		
9·03	1·08	7·54	17·65	10·11	4·17	10·45	25 01	.....	" "

TABLE II.—Results of the Examination of 59

Date of Collection.	No. of Sample.	Name and Address of Vendor.	Name and Address of Manufacturer or Furnisher as given by Vendor.	Name or Brand of Fertilizer.	Nitrogen.	
					Total, including that of Nitric Acid or Ammonia if present.	Total, calculated as Ammonia.
1900.		*Toronto.*	*Analyst, Dr. W. H. Ellis, Toronto.*		p. c.	p. c.
April 12	20691	J. A. Simmers....	W. A. Freeman Co., Ltd., Hamilton, Ont.	'Potato Manure'—		
				Guaranteed		3·00
				Standard sample..	3·96	4·81
				Sample as sold..	4·76	5·77
" 12	20692	" ...	"	'Celery and Early Vegetable'		
				Guaranteed		6·00
				Standard sample..	6·28	7·63
				Sample as sold..	6·23	7·56
" 12	20693	....	"	'Sure Growth Manure'—		
				Guaranteed		3·50
				Standard sample..	4 52	5·48
				Sample as sold..	4·45	5·40
" 12	20694	The Steele, Briggs Seed Company.	W. Harris & Co., Toronto.	'Bone Meal'—		
				Guaranteed		
				Standard sample..	4·66	5·66
				Sample as sold..	4·79	5·81
" 12	20695	...	Imported.....	'Sulphate of Potash'—		
				Guaranteed		
				Standard sample..		
				Sample as sold..		
" 12	20696	"	" ...	'Muriate of Potash'—		
				Guaranteed		
				Standard sample...		
				Sample as sold..		
" 12	20697	Wm. Rennie.....	"	'Nitrate of Soda'—		
				Guaranteed		
				Standard sample..		
				Sample as sold..	15·90	19·30
		Ottawa.				
" 17	20698	Graham Bros., Seedsmen, &c.	Wm. Faint, Peterborough, Ont.	'Ground Bone'—		
				Guaranteed		
				Standard sample..	4·28	5·20
				Sample as sold..	4·32	5·24
		Toronto.	*Analyst, F. T. Harrison, London, Ont.*			
" 2	19333	J. A. Simmers, King St.	W. Harris & Co., Toronto.	'Brand "H"'—		
				Guaranteed		
				Standard sample..	7·14	8·67
		Barrie, Ont.		Sample as sold..	7·15	8·68
" 3	19334	Wm. Taylor.....	W. A. Freeman Company, Hamilton, Ont.	'Freeman's Pure Bone'—		
				Guaranteed		3·00
				Standard sample..	2·90	3·52
				Sample as sold..	3·42	4·15
" 3	19335	"	"	'Sure Growth'—		
				Guaranteed		3·50
				Standard sample..	4·52	5·48
				Sample as sold..	4·55	5·53

SESSIONAL PAPER No. 14

Samples of Fertilizers as sold in 1900—*Continued.*

Results of Analysis.									
Phosphoric Acid.									
Soluble in Water.	Reverted or Citrate soluble.	Insoluble.	Total.	Total Available.	Potash.	Moisture.	Relative value per ton of 2,000 lbs	No. of Sample.	Official Analyst's Remarks.
p. c.	p. c.	p. c.	p. c.	p. c.	p. c.	p. c.	$ cts.		
.....	.....	.....	8·00	.....	5·00	.....	.....	20691	
5·44	2·51	2·18	10·13	7·95	6·14	4·51	25 89		
5·99	1·49	2·75	10·23	7·48	4·58	12·02	25 89	.....	Up to standard and guarantee.
.....	.....	.....	9.00	.....	6·00	.....	.....	20692	
5·10	1·82	2·50	9·42	6·92	8·17	4·55	32 52		
5 27	1·77	2·17	9·21	7·04	7·73	8·27	32 31	.....	" "
.....	.....	.....	8·00	.....	3·00	.....	.....	20693	
6·05	1·87	3·20	11·12	7·92	3·98	4·84	25 31		
6 55	1·19	1·85	9.59	7·74	3·27	11·65	23 83	.....	" "
.....	.....	.....	.....	.....	.....	.....	.....	20694	
0·45	8·05	11·65	20·15	20·15	0·50	4·12	32 74		
.....	7·29	11·90	19·19	19·19	.....	3·05	31 42	.....	" "
.....	.....	.....	.....	.....	.....	.....	.....	20695	
.....	.....	.....	.....	.....	.....	.....	.....		
.....	.....	.....	.....	.....	45·49	1·95	47 76	.....	Genuine.
.....	.....	.....	.....	.....	.....	.....	.....	20696	
.....	.....	.....	.....	.....	.....	.....	.....		
.....	.....	.....	.....	.....	52·14	.....	54 75	.....	"
.....	.....	.....	.....	.....	.....	.....	.....	20697	
.....	.....	.....	.....	.....	.....	.....	.....		
.....	.....	.....	.....	.....	.....	0·20	41 34	.....	"
.....	.....	.....	.....	.....	.....	.....	.....	20698	
0·77	5·31	15·67	21·75	21·75	0·39	5·32	33 11		
Trace.	11·26	12·54	23·80	23·80	.....	5·20	35 30	.....	Up to standard.
.....	.....	.....	.....	.....	.....	.....	.....	19333	
0·45	3·52	7·04	11·01	11·01	0·50	5·38	24 19		
0·32	3·58	3·90	7·80	7·80	0·31	8·58	25 70	.....	No guarantee given.
.....	.....	.....	23·00	23·00	.....	.....	.....	19334	
.....	7·84	16·88	24·72	24·72	.....	5·27	32 46		
.....	8·76	14·65	23·41	23·41	.....	4·65	32 50	.....	Genuine.
.....	.....	.....	8·00	.....	3·00	.....	.....	19335	
6·05	1·87	3·20	11·12	7·92	3·98	4·84	25 31		
6·14	1·60	2·36	10·10	7·74	3·07	9 82	23 98	.....	"

TABLE II.—Results of the Examination of 59

Date of Collection.	No. of Sample.	Name and Address of Vendor.	Name and Address of Manufacturer or Furnisher as given by Vendor.	Name or Brand of Fertilizer.	Nitrogen.	
					Total, including that of Nitric Acid or Ammonia if present.	Total calculated as Ammonia.
1900.		*Hamilton, Ont.*	*Analyst, F. T. Harrison, London, Ont.*		p. c.	p. c.
April 4	19336	J. A. Bruce, Seed Merchant.	.....	'Thomas' Phosphate'—		
				Guaranteed	.....	.....
				Standard sample...	.....	.....
				Sample as sold.....	.....	.....
" 4	19338	W. A. Freeman Co., Ltd.	Vendors	'Sure Growth'—		
				Guaranteed	.....	3·50
				Standard sample..	4·52	5·48
				Sample as sold..	4·34	5·27
" 4	19339	"	"	'Bone Meal'—		
				Guaranteed	.....	3·00
				Standard sample..	2·90	3.52
		St. Catharines.		Sample as sold..	3·63	4·40
" 4	19337	Titterington & Co.	Bradley Fertr. Co., Boston.	'Guano'—		
				Guaranteed	2.06	2·50
				Standard sample.....	1·49	1·80
		Ingersoll, Ont.		Sample as sold.....	2·01	2·44
" 7	19340	Ingersoll Packing Co.	Vendors..	'Blood, Bone and Tankage'—		
				Guaranteed	7·41	9·00
				Standard sample.....	7·84	9·52
		Seaforth, Ont.		Sample as sold.....	6·58	8·00
" 9	19342	Read & Wilson...	Bowker Fertr. Co., Boston.	'Sure Crop'—		
				Guaranteed	.....	Not
				Standard sample.....	.....	.....
				Sample as sold..	8·13	9·88

Samples of Fertilizers as sold in 1900—*Concluded.*

Results of Analysis.									
Phosphoric Acid.									
Soluble in Water.	Reverted or Citrate soluble.	Insoluble.	Total.	Total Available.	Potash.	Moisture.	Relative value per ton of 2,000 lbs	No. of Sample.	Official Analyst's Remarks.
p. c.	p. c.	p. c.	p. c.	p. c.	p. c.	p. c.	$ cts.		
.....	.....	.....	17·00	.....	.....	.....	.....	19336	
0·23	6·60	10·77	17·66	6·83	.....	.....	15 08		
0·38	5·83	9·85	16·06	6·31	.....	.....	13 76	.....	Adulterated on account of containing less than 8·00 p. c. of available phosphoric acid as required by the Act.
.....	.....	.....	8·00	.....	3·00	.....	.....	19338	
6·05	1·87	3·20	11·12	7·92	3·98	4·84	25 31		
5·75	1·33	3·73	10·81	7·08	3·16	11·30	23 22	.....	Genuine.
.....	.....	.....	23·00	23·00	.....	.....	.....	19339	
.....	7·84	16·88	24·72	24·72	.....	5·27	32 46		
.....	10·42	13·82	24·24	24·24	.....	5·35	33 99	.....	"
5·00	3·00	2·00	10·00	8·00	1·50	.....	16 42	19337	
6·90	2·88	3.20	12·98	9·78	1·85	11·00	17 93		
6·07	2·18	2·37	10·62	8·25	1·75	14·85	17 05	.....	"
.....	5·50	6·80	.....	.....	.....	6·00	30 63	19340	
1·09	5·63	6·08	12·80	12·80	0·48	10·54	32 90		
0·96	4·93	7·67	13·56	13·56	.....	8·60	30 03	.....	"
registered under this name.								19342	
.....	.....	.....	.....	.....	.....	.....	.....		
5·31	2·50	2·87	10·68	7·81	1·78	18·00	31 36		

MEMORANDA ON MANURES.

Since this publication is intended for circulation among our farmers, it has been thought advisable to take advantage of its issue by reprinting some of the notes which have appeared in former bulletins, and adding a few additional particulars from works which have recently appeared regarding the application of natural manures and artificial fertilizers.

It is nearly fifty years since Stockhardt, at that time professor in the agricultural school of Tharandt, Saxony, said that a farmer who bought guano, bonemeal, or other artificial fertilizers, and at the same time neglected to make proper use of the dung of the cattle on his own farm, must be regarded as an agricultural spendthrift. Every intelligent farmer in Canada will in these modern days agree with the old German professor, and maintain that the treasury of the farm is the dungstead, and that leaks and emanations from it of valuable fertilizing constituents must lead to financial embarrassment and possibly ruin.

This statement may be positively made without in the slightest degree detracting from the merits of artificial fertilizers, for, when properly selected and applied, their value becomes abundantly evident. The question as to whether their use is remunerative has been frequently discussed, and depends to a large extent on the care employed in their selection. Supposing that the intelligent farmer has considered composition, cost, &c., to the best of his ability, made his selection and applied the fertilizer, he may still be in doubt as regards the result unless he takes steps to make a manure trial with it. As regards the best way of doing this, Hellriegel,* has related his experience. He recognizes how difficult it is for practical agriculturists, fully occupied with their regular work, and engaged in meeting all the difficulties caused by workmen, weather and market rates, to carry out regularly planned manure experiments. He therefore describes a method which experience in his estimation had justified, and recommends it for the purpose of ascertaining whether any application of lime, marl, dung or fertilizers had really produced the improvement which from the point of view of cost had been expected. This plan is to pass over, at one or several places, properly selected, a few square rods of the field without applying the dung or fertilizer. In this way unmanured plots, which do not require to be measured with great exactitude, but merely paced, and do not need to be harvested separately, are left in the manured field, by means of which any improvement in the latter may be remarked and valued.

This plan exacts that it should be possible to see a distinct difference between the unmanured plots and the manured field, not only as regards the height and density of the resulting crop, but also in reference to the fullness of the ears and the developement of the grains. In the event of such a distinct difference being invisible the manure is justly discredited as unfit for its intended purpose. It would seem advisable to recommend this plan to farmers who use fertilizers, because some of them may manure the whole field, fail to see any improvement on account of being unable to make comparisons, and perhaps condemn the fertilizer unjustly. The simplicity of the plan above described, and its applicability everywhere and every year would appear to commend it to the practical agriculturist. At the same time it is necessary to remark that there are instances on record of fertilizers having been applied and remaining utterly without effect owing to some defect in the soil. Such defects have often been cured by a previous application of marl or lime, which not only produced good effects themselves, but improved also the action of the fertilizers afterwards applied.

THE CARE OF NITROGEN.

This element is the most valuable of fertilizing constituents, and one which is exceedingly liable to loss.

*Düngungsversuch und Vegetationsversuch ; Berlin, 1897.

In many of the fertilizers described in this and former reports their cost is very much increased by the admixture of nitrogenous constituents. This cost farmers might save by properly caring for the stock of nitrogen on their farms, and this stock might even be increased by cultivating those crops which have the power of appropriating the nitrogen of the atmosphere. Nevertheless the fertilizer manufacturers still seem to be under the necessity of supplying this element in considerable quantity in their goods, and of charging for it. In the case of the mixed fertilizers, this extra charge varies from $8 to $14 per ton, which the farmer must pay if he purchases, and which he can readily save in his own stables, or produce upon his own farm.

Nearly the whole of the nitrogen in the fodder fed to farm stock is to be found in the excreta of the animals, and one-half of it is contained in the urine. It is further well known that 95 per cent of the potash contained in the food of cattle and sheep may be recovered by carefully saving the liquid manure only. It has, however, been ascertained that stable-yard manure experiences considerable loss of its fertilizing constituents, but more especially of nitrogen, when left to itself in the dung heap. According to the experiments of Wolff, this loss amounts to 55 per cent of the nitrogen contained in fresh manure from horned cattle. The later experiments of Heiden and Holdefleiss place it at 23·4 per cent. These results were obtained when ordinary reasonable care is taken of the manure, but give no data for estimating the loss which occurs when, as is very frequently the case in Canada, the manure is treated with the grossest neglect. It is safe to assume that, generally, 50 per cent of the nitrogen contained in the barn-yard manure of this country returns unutilized to the atmosphere, or is otherwise lost by careless treatment. Supposing that an average quantity of 36,000 lbs. is produced in fresh condition annually by each animal, and that it contains 0·4 per cent of nitrogen, it follows that a loss of 72 lbs. of nitrogen, worth $8.64, takes place for each head of cattle. This loss can be prevented by daily strewing the stables with 2 lbs. of ground plaster for each animal, which at once prevents any smell of ammonia from arising in the stable. The quantity prescribed means 700 lbs. or a cost of about $2.50 annually for each 1,000 lbs. live weight, but, by adopting this plan, the farmer would to a great extent be relieved from the necessity of purchasing the nitrogen of artificial fertilizers.

In a pamphlet published by Vieweg in 1859, entitled 'Ein Pfund Stickstoff kaum einen Groschen' which may be freely translated 'A pound of nitrogen for a penny,' Dr. Meyer-Altenberg maintained that ground gypsum is the very best preservative of barn-yard manure when applied in the stable, because it secures 'certainty and completeness of effect, ease of execution, and the lowest possible cost.' He further described the effect of its application on the domain of Beberbeck in Hesse, and other impoverished farms, showing that it is possible to bring such into a fertile condition, without the purchase of manure or fertilizers or feeding stuffs, excepting a little straw for bedding and oats for the horses.

TREATMENT OF STABLE-YARD MANURE.

Dr. Meyer-Altenberg, in the little work above mentioned, takes care to point out that the use of gypsum, without subsequent careful treatment of the dungheaps, does not give the desired effect, and he dwells on the importance of having the manure thoroughly trodden down, and made as compact as possible. This is also shown in Dr. J. König's prize essay 'How can the farmer preserve and increase the stock of nitrogen on his property?' (Berlin, 1887.) In a special chapter of this work the author discusses 'The evolution of free nitrogen during the fermentation and storage of stable manure,' describes the experiments which were made from 1860 to 1885 regarding its treatment and gives finally the results of the discussion from which the following sentences may be translated with advantage :—

1. In the decomposition of nitrogenous substances of every nature a loss, more or less considerable, of free nitrogen takes place.

2. This loss is the greater the more the atmosphere has access to the decomposing mass.

3. Too much moisture is just as hurtful as too little. Stable manure requires such a degree of humidity as permits its components to lie close to each other.

4. The addition of substances which fix ammonia (such as gypsum, kainite and kieserite) prevent or reduce the loss of nitrogen. *These substances are, however, of little or no value if care is not taken at the same time to prevent as much as possible the access of air.*

12. In storing stable manure in dungsteads the latter must be watertight and roofed in, and the treading down of their contents by the farm animals is to be recommended.

One thing in connection with this question is perfectly certain and that is that the use of gypsum, or ordinary ground land plaster, prevents any loss of nitrogen in the stable, and while the manure is being forwarded to the dungheap. Further, if the work from which the foregoing quotations have been made be carefully studied, and also the experiments and writings of Holdefleiss, Vogel and others, it appears to be quite certain that the use of the same article, or of the gypsum produced in the manufacture of 'acid-phosphate,' completely prevents the loss of ammonia from the liquid part of the manure, and also from the organic nitrogen of the solids, provided the whole has, previous to fermentation, been made thoroughly compact, and atmospheric air almost completely excluded. Where it is found impossible to attend to the latter precautions, the safest way will probably be found to lie in avoiding fermentation altogether, by conveying the fresh manure, after treatment with gypsum, on to the field to be manured and bringing it under the soil as rapidly as possible. The latter practice has been proved to be most advantageous by the experiments which have been carried on for some time past, at the Central Experimental Farm by Director Saunders. (See Reports for 1898.)

Not only has the addition of substances which have the faculty of fixing ammonia been recommended for stable manure, but its improvement to a greater extent has been proposed by the addition of fertilizers. The following quotation is taken from Bulletin No. 45 (for March, 1897) of the Massachusetts Agricultural College, and was written by Dr. C. A. Goessmann, Chemist for that institution :—

'*The practice of adding to the manurial refuse materials of the farm as stable manure, vegetable compost, &c., such single commercial manurial substances as will enrich them in the direction desirable for any particular crop to be raised, does not yet receive that degree of general attention which it deserves*' (The italics are in the original.) An addition of potash in the form of muriate or sulphate of potash, or of phosphoric acid in the form of fine ground South Carolina or Florida soft phosphate, &c., will in many instances not only improve their general fitness as complete manure, but quite frequently permit a material reduction in the amount of barn-yard manure ordinarily considered sufficient to secure satisfactory results.

'Average composition of seventy-five samples of barn-yard manure :—

	Per cent.	Lbs. per ton.
Moisture.	67·00	1,340·0
Nitrogen	0·52	10·4
Potassium Oxide	0·56	11·2
Phosphoric Acid..	0·39	7·8

'The average barn-yard manure contains, it will be noticed from the above statement, a larger percentage of nitrogen, as compared with its potash and phosphoric acid than is generally considered economical. An addition of from thirty to forty pounds of muriate of potash, and of one hundred pounds of fine ground natural phosphate (soft Florida or South Carolina floats) per ton of barn-yard manure would greatly increase its value as an efficient and economical general fertilizer.'

These are no doubt most excellent suggestions, and there is no reason why these substances should not be introduced into the stable manure in the same manner as in the case of the ground plaster above mentioned. Plain superphosphate and kainite might also be used, some of the constituents in which would be useful in fixing the ammonia, as soon as formed from the organic nitrogen. Should this suggestion be found to have practical value, there is no doubt that our fertilizer manufacturers would be found able to supply our farmers, at a moderate cost, with a mixture of ground plaster, superphosphate and kainite, in such proportions as experience might show to be most

advantageous. No better application can be made of the wood ashes produced in the farmer's household than by mixing them with the barn-yard manure, and most excellent results are known to have followed this practice.

ACQUISITION OF NITROGEN.

Not only can the farmer save almost the whole of the nitrogen contained in the fodder fed to his cattle, but he can actually increase the stock of it stored away in his fields, agricultural products and manure heaps, by a judicious course of crop rotation. For more than a century agricultural chemists have discussed the question as to whether free atmospheric nitrogen can be assimilated by plants, but it may now be regarded as perfectly settled in the affirmative, if regard is had only to the plants of the order leguminosæ, such as beans, pease, lentils, vetches, clovers, alfalfa, serradella, &c. Even the great English agriculturists, Sir J. B. Lawes and Sir Henry Gilbert, who had previously been of an opposite opinion, have now admitted that this appropriation of nitrogen has been completely proved. This acknowledgment was made by Sir Henry Gilbert, at a great meeting of agricultural chemists held at Halle, in Germany, in September, 1891. Thus, modern research has confirmed not only modern agricultural practice, but also the experience of antiquity, for Prof. W. Strecker has pointed out a passage in Pliny which says: 'Lupines require so little manure that they in fact replace it; vetches make the land more fertile. Corn should be sown where previously lupines or vetches have stood, because they enrich the land.'

It is not, however, to be supposed that this utilization of atmospheric nitrogen by leguminous plants can take place upon very poor soils or upon those destitute of the inorganic constituents which they require. The latter must in such cases be supplied in the shape of potash with some phosphoric acid, as was done with great success by Schultz, of Lupitz, a practical agriculturist in North Germany. In fact, had it not been for his investigations, the controversy above referred to might have continued without results up to the present hour.

Professor König, of Münster, gives the following summary of Schultz's experience:—

'Schultz acquired the farm Lupitz in the year 1855; its soil consisted of a poor, cold diluvial sand; the profit in working it was very small. Lupines yielded indeed as fodder tolerable results, but when used as green manuring for rye and oats, no return was obtained from them. The application of artificial manures produced good crops, but they did not pay; burnt lime showed itself to be too heating. The use of manure was more favourable, especially when fertilizers containing phosphoric acid were used at the same time. But at the best the total results was not satisfactory.

'Shortly after Schultz acquired Lupitz, the great discovery of potash salts was made, and about 1860 they began to be produced from the mines of Stassfurth. Schultz made up his mind to try them as manure and he obtained the most surprising results. After lupines had shown themselves to be useless as forerunners of grain, they were excluded from the rotation, and grown on a separate field without any manuring and alternating with sheep pasture. But the harvest on these became worse and worse until the field in question became quite lupine "sick." Schultz made his first trial on this field, manuring it with 300 pounds kainite per morgen (1 Prussian morgen = 0·631 acre); the sickness was at once cured, and for twenty-five years afterwards Schultz has grown lupines on this ground without interruption, always with the application of 300 pounds kainite. Schultz obtained similar good results on the ground which had received the marl, by the application of potash salts. This ground had indeed yielded well with lupines for two years after the application of the marl, but in the third year they sickened here too. When, however, 300 pounds kainite were applied here and ploughed in the fall, the ground was cured, although an application of phosphates had not produced the desired results.

'The favourable influence which the manuring with kainite or potash salts had exerted on lupines induced Schultz to try them on grain, in conjunction with phosphates. But in this case he obtained contradictory results according to the nature of the

crops which preceded the grain. For instance, while grain sowed after lupines and manured with potash and phosphates yielded very good and remunerative harvests, these were not to be obtained if grain was grown after grain or after potatoes. This behaviour of these crops was explained by Schultz in this way: that lupines as deep-rooted plants leave in the soil after harvest a residue of root, in which a considerable amount of nitrogen has accumulated, an amount sufficient to supply the wants of the following grain crops: that, on the other hand, the application of potash and phosphates to grain, after a preceding grain crop, is without effect, for the season that the latter had consumed the stock of nitrogen. Grain crops always reduce this stock; never increase it. Schultz has given the name "nitrogen collectors" to the lupines and similar plants, while grains are called 'nitrogen consumers." His system of rotation is therefore the following:—Sow first nitrogen collectors (lupines, pease, beans, vetches, clover, lucerne, serradella, &c.), or, as they have been called, renovating crops, and give them 300 lbs. kainite per morgen, with perhaps an addition 20 lbs phosphoric acid. After harvesting the nitrogen collectors, sow a nitrogen consumer, raising a grain or exhausting crop, giving it also 300 lbs. kainite and 20 lbs. phosphoric acid. The grain crop is perfectly successful, because the first crop left behind it nitrogen enough to supply the wants of the grain. In this way the keeping of stock, which is expensive on a poor sandy soil, can be reduced and the purchase of nitrogenous fertilizers dispensed with, because the nitrogen collectors are able to stock the soil with that valuable element.'

The foregoing description is taken from Professor Konig's 'Stickstoff Vorrath,' published in 1887 (Paul Parey, Berlin). It was in 1884, nearly thirty years after the purchase of his sandy farm, that Schultz, of Lupitz, published the results of his experience, although they did not contain anything very new and although they only confirmed experiences still older than his own. But his case was surprising and his explanation of the cause of his successful farming challenged the attention of scientific agriculturists. The consequence has been the issue of many pamphlets on the subject, and an activity in the region of agricultural experimenting which is not yet ended. Atwater, Wagner, Heiden, Hellriegel, and many others have participated in these investigations, and Professor Wood, of the Storrs Agricultural School in Connecticut, has given the following general conclusions as the result of the work:—

1. 'Pease, alfalfa, serradella lupine, clover in all probability, and apparently leguminous plants in general, are able to acquire large quantities of nitrogen from the air during their period of growth.

2. 'There is scarcely room to doubt that the free nitrogen of the air is thus acquired by plants.

3. 'That there is a connection between root tubercles and this acquisition of nitrogen is clearly demonstrated. What this connection is, what are the relations of micro-organisms to the root tubercles and the acquisition of nitrogen, and in general how the nitrogen is obtained are questions still to be solved.

4. 'The cereals with which the experiments have been completed have not manifested this power of acquiring nitrogen, nor do they have such tubercles as are found on the roots of legumes.

5. 'In the experiments here reported, the addition of soil infusions did not seem necessary for the production of root tubercles. A plausible supposition is that the micro-organisms or their spores were floating in the air and were deposited in the pots in which the plants grew.

6. 'As a rule the greater the abundance of root tubercles in these experiments, the larger and more vigorous were the plants and the greater was the gain of nitrogen from the air.

7. 'In a number of these experiments, as in similar ones previously reported, there was a loss of nitrogen instead of gain. The loss occurred where they were no root tubercles; it was especially large with oat plants, and largest where they had the most nitrogen at their disposal in the form of nitrates. As the gain of nitrogen by the legumes helps explain why they act as renovating crops, the loss in the case of the oats suggests a possible reason why they should appear to be an exhausting crop.

'Practical inferences:—The ability of legumes to gather nitrogen from the air helps to explain the usefulness of clover, alfalfa, pease, beans, vetches and cow pease as renovating crops, and enforces the importance of these crops to restore fertility to exhausted soils. The judicious use of mineral fertilizers (containing phosphoric acid, potash and lime) will enable the farmer to grow crops of legumes which, after being fed to his stock, will, with proper care to collect and preserve all manure, both liquid and solid, enable him to return a complete fertilizer in the shape of a barn-yard manure to his land. A further advantage of growing these crops is that the nitrogenous material, protein, which they contain in such great abundance, is especially valuable for fodder.'

From the foregoing it seems that, in the present condition of our knowledge, the conclusion may be drawn that the atmosphere stands ready to furnish the farmer, gratis, with all the organic constituents which his crops require, provided always that he, on his part, will exercise a sufficient amount of skill and intelligence in appropriating and retaining on his farm the fertilizing materials, and especially the nitrogen. If he does this, all that is necessary for him to provide, in order to replace the losses which his farm sustains from the sale of stock or produce, are the inorganic or mineral constituents of these, and especially the phosphoric acid and potash. There is much in all this to remind one of Sprengel and Liebigs teaching of fifty years ago, according to which a plant cannot thrive if its soil does not contain all the substances which are to be found in its ash.

UTILIZATION OF SEWAGE.

The losses in fertilizing material which are sustained, as above mentioned, on account of the neglect or unscientific treatment of barn-yard manure, are very trifling when compared with those which the community suffers in the almost total loss of the nitrogen, phosphoric acid and potash contained in human excreta. The utilization of such always becomes a subject for discussion when the question is raised as to how a cheaper class of manures than the artificial fertilizers can be obtained for use in agriculture.

Where the water carriage system of removing sewage and excrement has been introduced, nothing is to be hoped for in the recovery of their fertilizing constituents. Even in cases where, at large expense, establishments have been erected for the treatment of sewage by precipitation or similar methods, the products have been found to be entirely destitute of agricultural value. The greater part of the fertilizing constituents of sewage are in such a soluble condition, and have been diluted with water to such an extent, as to render their recovery economically impossible. It has been attempted in the neighbourhood of many cities in England and on the continent of Europe to use the sewage for irrigation and as liquid manure, but this method of utilization has been found to be in the highest degree imperfect. At Berlin it has been proved, that of the nitrogen contained in its sewage, at the very most only 13·8 per cent is found in the agricultural products of all the magnificent farms irrigated by it in the neighbourhood of the city. When the use of water for removing house refuse is excluded, and ordure and urine are removed as manure in their natural state, their utilization is possible, and is made a source of revenue in such towns as Stuttgart, Groningen, Greifswald, &c. But the systems of this class which are in use have all their disadvantages, as is proved by the tendency which municipal authorities constantly show to adopt the water carriage system. The greatest disadvantage under which these systems labour is the difficulty caused by the offensiveness to sight and smell of the material with which they have to deal. This has been entirely met by the use of moss litter as an absorbent, deodorizer, and disinfectant.

Canada possesses in its bogs and swamps inexhaustible quantities of moss litter, which is frequently found in beds, several feet in thickness lying above the peat. The following tests have been made in the Inland Revenue Laboratory, of moss litter from various localities in the Dominion :—

	Moisture.	Ash.	Nitrogen.
	per cent.	per cent.	per cent.
Moss Litter, Berwick, N.S.	14·40	1·16	1·26
Black Muck " "	13·30	3·68	1·58
Sphagnum moss from Shippegan, N.B.	12·45	1·55	0·55
Light coloured moss litter from Lincoln Parish, N.B.	11·55	1·40	1·79
Dark coloured sample from the foregoing locality.	10·95	0·80	1·06
Moss litter from Musquash, N.B., upper layer.	11·50	0·95	0·82
Moss litter from same locality, lower layer.	12·50	0·90	0·72
Peat from St. Bridget, Prov. Quebec.	13·30	2·50	1·48
Peat from St. Hubert, Quebec.	12·35	2·68	1·84
Light coloured moss litter from Caledonia Springs.	10·00	1·60	2·95
Dark coloured moss litter from same locality.	11·60	2·70	2·23
Peat from the same locality.	10·95	3·90	2·94
Surface moss from the Mer Bleue at Eastman's	10·85	2·80	0·71
Surface moss from the Mer Bleue at Baldwin's Farm.	7·90	2·66	1·47
Surface moss from the Mer Bleue at Baldwin's Farm 18 inches deep.	27·90	1·72	1·64
Peat from Mer Bleue at McFadden's Farm, wide ditch, Navan	22·60	4·40	2·21
Peat from Mer Bleue, McFadden's Farm, narrow ditch, Navan	9·40	6·62	2·80
Peat from near Stratford, Ont.	16·80	9·10	1·91
Hypnum moss from near Stratford, Ont.	8·75	9·72	2·01
Moss litter from bog in Welland County, Ont.	3·85	4·70	1·51
Peat lying underneath the foregoing.	5·30	4·85	1·41
Peat from same locality, lying 4½ feet below surface.	3·25	41·25	1·52

The first public mention of the usefulness of moss litter as a deodorizer and absorbent seems to have been made by Dr. Ludwig Happe, in Braunschweig, in December, 1880, since which time its application for the purpose has gradually increased until now, when the system has been introduced into several towns in Germany, and is also practised in Congleton, Cheshire, England. In Canada this method of deodorizing human refuse has been in use for years at Caledonia Springs. It, of course, at once recalls the dry earth system, regarding which great expectations were at one time entertained. The advantages of moss litter over dry earth for the purposes in question are, however, very decided. They consist in the perfect inoffensiveness of the moss litter product, in the fact that one part of moss litter will deodorize and dry at least six parts of mixed excreta, and in the greater agricultural value of the resulting manure. Dry earth (which is required in quantity at least equal to that of the excreta) is value-

less from an agricultural point of view, but this is not the case with moss litter, which as the above analysis shows, often contains as much nitrogen as ordinary barn-yard manure. Numerous analyses have been made of moss litter manure as produced in Germany, and its average contents from seven different towns may here be stated.

	p. cent.	lbs. per ton.		Value per ton.
Nitrogen	0·664	13·28	at 13c.	$1 72
Phosphoric acid	0·350	7·00	5	0 35
Potash	0·285	5·70	5¼	0 30
Water	83·00			$2 37

Numerous trials have been made on various crops with this manure, and very satisfactory results are always reported. In all cases it is stated to excel barn-yard manure even when the latter is used in much greater quantity.

The manufacture of moss litter has been attempted at Musquash, in New Brunswick, and also in Welland County, Ontario. From the latter locality I was supplied with several bales of the moss litter for experimental purposes, and Dr. Laberge, of Montreal, undertook to superintend the carrying out of an experiment to determine its deodorizing and absorbent qualities. He reported that 100 pounds of moss litter were sufficient for drying 800 pounds of ordinary excreta from privy pits in Montreal, and rendering it entirely inoffensive. A sample of the product remained for days in my office without attracting notice, and indeed it was quite devoid of odour. Its analysis gave the following results :—

	Per cent.	Pounds per ton.		Value per ton.
Nitrogen	1·31	26·2	at 13c.	$3 41
Phosphoric acid	0·90	18·0	at 5	0 90
Potash	0·14	2·8	at 5¼	0 15
Water	65·47			$4 46

The valuation of ordinary fresh barn-yard manure with 75 per cent of water is about $2 per ton ; with 67 per cent water, as in the case of the average given above by Dr. Goessmann, the value is nearly $2.25. Therefore, much better results might be expected agriculturally from a ' moss manure ' of the composition just described.

Moss litter might also be applied with great advantage in public urinals. When a sample of it was supersaturated with urine and dried, and this process repeated several times, no offensive odours were developed and the product was found on analysis to contain 12·41 per cent of nitrogen which is equal to a valuation of $29.78 per ton.

These facts are reported in order to show that Canada possesses in her waste lands abundance of material which might be used in our towns and villages for the production of a very valuable manure, with the simultaneous introduction of very many sanitary advantages. It is not to be expected that cities or towns which are advantageously situated for the water carriage system, or which have already adopted it, will make any changes, but there are many towns and villages in the Dominion where the application of the moss litter system would be very suitable, and the authorities of which, by selling the product or giving it gratis to the farmers of the neighbourhood, might confer a great advantage on agriculture.

APPENDIX N.

BULLETIN No. 71.—CREAM OF TARTAR.

LABORATORY OF THE INLAND REVENUE DEPARTMENT,
OTTAWA, September 10, 1900.

E. MIALL, Esq.,
Commissioner of Inland Revenue.

SIR,—I have the honour herewith to return you file 81857, accompanied by a report upon the analysis of 65 samples of Cream of Tartar which have been collected and examined in accordance with your instructions contained in the file above mentioned.

The samples analysed were taken in different cities and towns throughout the Dominion, as shown in detail in the accompanying report; and I beg to recommend that this report be published as Bulletin 71 of the series issued from this laboratory.

The collections were made in June of this year, and the results of analysis herewith presented are the work of the various district analysts, except in the case of British Columbia. I have, in the case of these samples, entered the percentage number obtained in this laboratory, so as not longer to delay the publication of the Bulletin.

It is interesting to note the fact that a great improvement has taken place since the first samples of this article were examined in 1887. In that year 36 samples were examined, of which 22 (equivalent to 61 per cent) proved to be genuine. The next collection of samples of Cream of Tartar was made in 1889, when 86 samples were analysed (see Bulletin 12) and 52 (equivalent to 60 per cent) were found to be genuine. In 1896 a series of 99 samples was examined, and 65 samples (equivalent to 66 per cent) were found to be genuine. Of the present collection, comprising 65 samples, 57 (equivalent to 88 per cent) are found to be genuine Cream of Tartar. These results are more striking when tabulated, as below :—

Date of Collection.	Total samples.	Genuine.	Genuine, stated as a percentage of the whole.
1887	36	22	61
1889	86	52	60
1896	99	65	66
1900	65	57	88

Although 88 per cent of the samples collected have been classified as *genuine*, it is not to be supposed that these samples are of equal quality among themselves. Chemical purity is not to be expected in a commercial Cream of Tartar. By repeated crystallization of the crude Argols, a separation of lime salts is effected, and the so-called *refined tartar*, or Cream of Tartar may be brought to contain 95 per cent (or even more than this) of bi-tartrate of potassium. The British Pharmacopœia fixes the maximum limit of impurity at $2\frac{1}{2}$ per cent for Potassii Tartras Acidus or *purified* Cream of Tartar.

I suggested in 1889 (Bulletin 12) that commercial Cream of Tartar containing more than 10 per cent of Calcium Tartrate should be considered as *low grade*, and so designat-

ed in our reports. I find that 63 per cent of the samples classed as genuine in the accompanying table, will fall into the sub-class *low grade* on the basis of this assumption. Applying this to the samples collected during past years, I find as follows :—

CREAM OF TARTAR.

Date of collection.	Total genuine samples.	Number containing more than 10 p. c. Tartrate of lime.	Same as a percentage on the total number.
1887	22	16	73
1889	52	31	60
1896	65	19	30
1900	57	36	63

It thus appears that while a decided improvement has taken place so far as the genuineness of Cream of Tartar is concerned, the quality or *grade* of that article found upon our markets has not improved during the last decade.

In Bulletin 26 (page 10-11) I have calculated the average percentages of Calcium Tartrate determined by myself in 70 samples of genuine Cream of Tartar, and found 10.66 per cent. It cannot be urged that the high percentage of Calcium Tartrate found in many of these samples is injurious to health, but it is distinctly a loss to the purchaser of the article, since the tartaric acid combined with lime is not available to him ; and it is matter for surprise that refiners do not recover this tartaric acid, thus improving the character of the Cream of Tartar, and realizing—I am induced to think—a handsome margin of profit.

I have the honour to be, sir,

Your obedient servant,

A. McGILL,

Acting Chief Analyst.

64 VICTORIA, A. 1901

RESULTS of the examination of 65

Serial Number.	Sample Number.	Date of collection.	Quantity purchased.	Price.	Name and Address of Vendor.	Available Acidity, c.c. normal.	Bitartrate of Potash.	Free Tartaric Acid.
		1900.		$ cts.	*Halifax, N.S.*	Per 100 grms.	p. c.	p. c.
1	16775	June 5.	3 pkgs.	0 30	N. Cornfoot, Sackville Street..... ...	470·	88·36	.....
2	16776	" 5.	1 lb ...	0 40	B. J. Hubley, Barrington Street.....	468·	87·98	.....
3	16777	" 5.	1 " ...	0 40	E. W. Crease, Argyle Street.....	464·8	87·38	.....
					Dartmouth, N.S.			
4	16778	" 6	3 pkgs.	0 40	T. Gentles & Son	461·	86·66	.....
5	16779	" 6.	1 lb ...	0 40	G. C. DeWolfe & Son	454·8	85·50	.....
					St. John, N.B.			
6	17711	May 30.	¾ " ...	0 25	Baird & Peters, Ward Street.....	478·	89·86	.....
7	17712	" 30.	1 " ...	0 35	W. A. Porter, 215 Union Street.....	460·	86·48	.....
8	17713	" 31.	1 " ...	0 40	F. E. Williams, cor. Charlotte and Princess Streets.	465·2	87·46	.....
9	17714	June 4.	¾ " ...	0 30	Vanwart Bros., cor. Duke and Charlotte Streets.	468·	87·99	.....
10	17715	" 5.	1 " ...	0 35	Philips & Watson, Douglas Ave.....	468·	87·99	.....
					Quebec.			
11	19912	" 4.	1 " ...	0 40	A. Rinfret, 414 St. Joseph Street	450·	84·60	.....
12	19913	" 4.	1 " ...	0 36	F. Auger, 728 St. Valier Street.....	460·	86·48	.....
13	19915	" 4.	1 " ...	0 40	Kirouac & Frère, 713 St. Valier Street..	466·	87·61	.....
					Danville, Que.			
14	19916	" 5.	1 " ...	0 40	James Houston.....	482·	90·62	.....
15	19917	" 5.	1 " ...	0 40	Moïse Vigneau.....	472·	88·74	.....
16	19918	" 5.	1 " ...	0 30	A. MacLeay & Riddell Bros	464·	87·23	.....
					St. Hyacinthe, Que.			
17	19919	" 18.	1 " ...	0 40	J. B. St. Pierre, 256 Cascade Street	461·	86·67	.....
18	19920	" 18.	1 " ...	0 40	Josh. Brodeur, Cascade Street	465·	87·42	.....
19	19921	" 18.	1 " ...	0 40	V. Marceau, St. François Street.....	476·	89·49	.....
20	19922	" 18.	1 " ...	0 40	Gregoire et Frère, 33 Cascade Street ...	493·	92·68	.....
21	19914	" 4.	1 " ...	0 40	A. Ruelland, 6 Bagot Street, Quebec	.....	.....	.....
					Ottawa.			
22	18380	" 7.	¼ " ...	0 27	R. Palmer, 108 Bank Street.....	462·5	79·64	0·39
23	18381	" 7.	½ " ...	0 20	Industrial Co-operative Association, 234 Bank Street.	456·	85·73	.....
24	18382	" 7.	¼ " ...	0 20	F. C. Daniels, 270 Bank Street..... ...	482·	90·62	.....
25	18383	" 7.	¾ " ...	0 20	T. Martin, 43 Third Ave	470·	88·36	.....
26	18384	" 7.	¾ " ...	0 30	C. Moreland, cor. Bank and Fourth Ave.	525·	98·70	.....
27	18385	" 7.	¾ " ...	0 20	G. T. Barrett, Ottawa East	467·	87·80	.....
28	18386	" 7.	½ " ...	0 20	Mary McDougall, Nicholas Street	474·	89·11	.....
					Smith's Falls, Ont.			
29	18387	" 8.	½ " ...	0 20	J. W. Rutherford, grocer.....	433	81·40	.....
30	18389	" 8.	½ " ...	0 20	H. Lyng, grocer	471·	88·55	0·056
					Smith's Falls, Ont.			
31	18390	" 8.	½ " ...	0 20	Jas. Murray.....	474·	89·11	.....
32	18391	" 8.	½ " ...	0 20	Jas. Sutherland.....	453·	85·16	.....

Samples of Cream of Tartar.

Results of Analysis.						Serial Number.	Remarks by Analyst.	Analyst.
Calcium Tartrate.	Sulphuric Acid (SO_3).	Phosphoric Acid (P_2O_5)	Calcium Oxide (CaO).	Alumina (Al_2O_3).	Starch.			
p. c.	p. c.	p. c.	p. c.	p. c.	p. c.			
11·93	Traces.	.....	2·57	.....	.....	1	Genuine, but containing excess of calcium tartrate.	M. Bowman, Halifax, N.S.
12·06	"	.....	2·60	.....	.....	2	"	"
12·02	"	.....	2·59	.....	.....	3	"	"
12·35	"	.....	2·66	.....	.....	4	"	"
14·39	"	.....	3·10	.....	.....	5	"	"
10·16	"	.....	2·19	.....	.....	6	"	"
12·11	"	.....	2·61	.....	Trace	7	"	"
11·74	"	.....	2·53	.....	.....	8	"	"
12·07	"	.....	2·56	.....	.....	9	"	"
11·79	"	.....	2·54	.....	.....	10	"	"
14·56	0·20	.....	3·28	.....	.....	11	Genuine	Dr. M. Fiset Quebec.
11·44	0·40	Traces.	2·74	.....	.....	12	"	"
10·66	.....	Sl. trace	2·30	.....	.....	13	"	"
8·58	.....	.....	1·85	.....	.....	14	"	"
9·36	.....	.....	2·02	.....	.....	15	"	"
10·92	.....	.....	2·35	.....	.....	16	"	"
12·63	.....	.....	2·90	.....	.....	17	"	"
11·57	Sl. trace	.....	2·50	.....	.....	18	"	"
9·46	.....	.....	2·18	.....	.....	19	"	"
6·76	.....	.....	1·46	.....	.....	20	"	"
.....	.....	.....	.....	.....	.....	21	This sample, although labelled cream of tartar, consists essentially of boracic acid; adulterated.	"
9·53	2·22	1·9	3·75	0·168	4·17 maize.	22	Adulterated	Dr. F. X. Valade, Ottawa.
12·09	.....	.....	2·66	.....	.....	23	Genuine, but of inferior quality.	"
7·28	.....	.....	1·78	.....	.....	24	Genuine	"
10·79	.....	.....	2·45	.....	.....	25	" but of inferior quality.	"
1·28	.....	.....	0·30	.....	.....	26	"	"
11·50	0·158	.....	2·79	0·034	.....	27	Doubtful	"
9·36	.....	.....	2·12	.....	.....	28	Genuine	"
11·07	3·84	.....	5·21	0·008	.....	29	Doubtful	"
10·68	.....	.....	2·31	.....	.....	30	Genuine, but of inferior quality.	"
9·38	.....	.....	2·02	.....	.....	31	Unadulterated	Dr. W. H. Ellis, Toronto.
16·11	.....	.....	3·47	.....	.....	32	Unadulterated, but low grade	"

RESULTS of the Examination of 65

Serial Number.	Sample Number.	Date of Collection.	Quantity purchased.	Price.	Name and Address of Vendor.	Available Acidity, c.c. normal.	Bitartrate of Potash.	Free Tartaric Acid.
		1900.		$ cts.		Per 100 grms.	p. c.	p. c.
33	18292	June 8.	½ lb ...	0 20	*Perth, Ont.* W. H. Churchill.....	498·	93·62	.....
					Ottawa.			
34	18393	" 9.	½ " ...	0 20	Baldwin Bros., Nicholas Street.....	459·	86·29	.....
35	18394	" 9.	½ " ...	0 20	C. Elliott, 246 Rideau Street.....	477·	89·67	.....
					Toronto.			
36	18395	" 9.	½ " .	0 20	W. Goddard, Queen W.....	526·	98·88	.....
37	18396	" 9.	½ " ...	0 20	John Hickman, 272 College Street.....	469·	88 17	.....
38	18397	" 9.	½ " ...	0 10	M. E. Godard, 454 King Street W.....	461·	86·66	.....
					St. Catharines.			
39	18398	" 9.	½ " ...	0 20	Moore & Pakman.....	467·	87·79	.....
40	18400	" 9.	½ " ...	0 20	D. L. Cruikshank.....	469·	88.17	.....
					Guelph, Ont.			
41	19352	May 29.	1 " ...	0 40	J. A. McCrea.....	503	79·71	0·68
42	19353	" 29.	1 " ..	0 40	Scroggie Bros	462·	86·89	.....
43	19354	" 29.	1 " ...	0 40	Jackson & Son.....	223·	29·33	5·02
					Stratford, Ont.			
44	19355	" 30.	1 " ...	0 40	Barnsdale Trading Company.....	463·	87·06	.....
45	19356	" 30.	1 " ...	0 40	C. McIlhargey.....	447·	84·00	.....
					London, Ont.			
46	19357	" 30.	1 " ...	0 40	Jas. Wilson.....	522·	98·13	.....
					Windsor, Ont.			
47	19358	" 31.	1 " ...	0 40	W. J. Cherney.....	466·	87·57	.....
48	19359	" 31.	1 " ...	0 30	John Scott.....	468·	87·91	.....
49	19360	" 31.	1 " ...	0 40	Mason Tea Co	473·	83·10	.....
					Winnipeg, Man.			
50	17237	June 18.	1 " ...	0 40	J. Coltart.....	483·8	90·96	.....
51	17238	" 18.	1 " ...	0 40	F. Rosenblat.....	.....	.....	.....
52	17238	" 18.	1 " ...	0 50	Wm. Magee.....	481·0	90·43	.....
53	17240	" 18.	1 " ...	0 40	W. H. Morgan.....	476·2	89·52	.....
54	17241	" 19.	1 " ...	0 40	The Hudson Bay Co., Lower Fort Garry	451·3	94·25	.....
					Selkirk, Man.			
55	17242	" 19.	1 " ...	0 40	Woodlinger & Finkelman.....	471·2	88·58	.....
56	17243	" 19.	1 " ...	0 35	Wm. Epstein.....	336·	48·95	.....
57	17244	" 19	1 " ...	0 50	Rosen & Duggan.....	507·1	95·33	.....

Samples of Cream of Tartar—*Continued.*

Results of Analysis.						Serial Number.	Remarks by Analyst.	Analyst.
Calcium Tartrate.	Sulphuric Acid (SO_3).	Phosphoric Acid (P_2O_5)	Calcium Oxide (CaO).	Alumina (Al_2O_3).	Starch.			
p. c.	p. c.	p. c.	p. c.	p. c.	p. c.			
7·27	...	...	3·00	...	...	33	Unadulterated	Dr. W. H. Ellis, Toronto.
13·23	...	...	2·85	...	...	34	Unadulterated, but low grade.	"
9·38	...	...	2·02	...	...	35	Unadulterated	"
...	...	...	...	...	...	36	Unadulterated and pure.....	"
11·84	...	...	2·55	...	...	37	Unadulterated, but low grade..	"
11·84	...	...	2·55	...	...	38	" " ..	"
12·33	...	...	2·65	...	...	39	" " .	"
11·60	...	...	2·50	...	...	40	" "	"
0·13	9·70	...	4·55	1·19	Trace... (corn)	41	Adulterated with tartaric acid, alum and gypsum.	Mr. F. T. Harrison, London, O.
9·62	1·30	...	3·20	...	...	42	Low grade. Very much below B.P. standard.	"
3·12	28·72	...	20·90	...	...	43	Adulterated with tartaric acid and over 60 p.c. of gypsum.	"
9.23	1·26	...	3·10	...	...	44	Low grade. Very much below B.P. standard.	"
14·56	0·16	...	3·50	...	...	45	" " ..	"
0.91	Trace.	...	0.21	...	...	46	Pure.	"
9·23	0·94	...	2·83	...	...	47	Low grade. Very much below B.P. standard.	"
10·40	0·22	...	2·47	...	...	48	" "	"
11·31	1·70	Trace...	2 70	0·54	Trace... (Corn)	49	Adulterated.	"
8·07	...	...	1·74	...	...	50	Genuine	Prof. E. B. Kenrick, Winnipeg.
...	8·67	4·78	3·65	3·35	55·04 (Corn)	51	Adulterated. This sample is an alum phosphate baking powder and does not contain any cream of tartar.	"
10·28	...	...	2·20	...	...	52	Genuine . ..	"
9·90	...	...	2·13	...	...	53	" . ..	"
5·83	...	...	1·25	...	...	54	"	"
10·85	...	...	2·34	...	...	55	"	"
...	6·48	14·80	12·13	...	9·32 (Corn)	56	Adulterated to the extent of about 50 p.c. with starch and phosphate of lime.	"
5·07	...	...	1·09	...	...	57	Genuine ...	

RESULTS of the examination of 65

Serial Number.	Sample Number.	Date of Collection.	Quantity Purchased.	Price.	Name and Address of Vendor.	Available Acidity, c.c. normal.	Bitartrate of Potash.	Free Tartaric Acid.
		1900.		S cts.	*Vancouver, B.C.*	Per 100 grms.	p. c.	p. c.
58	20177	June 13. 1	lb...	0 50	Welsh & Nightingale	478	89·9	..
59	20178	" 13. 1	" ...	0 35	Geo. Wagg	476	89·5	— —
60	20180	" 13. 1	" ...	0 40	Vanir Grocery Company, ...	472·	88·7	—
61	20181	" 13. 1	" ...	0 35	LaBelle & Co	454	85·4	. . .
					Victoria, B.C.			
62	20188	" 15. 1	" ..	0 40	F. Came, jr	528·	99·3	....
63	20189	" 15. 1	" .	0 50	Mowat & Wallace	464	87·2	...
64	20190	" 15. 1	" ...	0 40	Hardress Clarke	566	95 1	— .
65	20191	" 15. 1	" ...	0 40	L. Dickson	428·	82 3	.. ..

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Samples of Cream of Tartar—*Concluded.*

Results of Analysis.						Serial Number.	Remarks by Analyst.	Analyst.
Calcium Tartrate.	Sulphuric Acid (SO_3).	Phosphoric Acid (P_2O_5)	Calcium Oxide (CaO).	Alumina (Al_2O_3).	Starch.			
p. c.	p. c.	p. c.	p. c.	p. c.				
5·20			2·74			58	Genuine	A. McGill, Ottawa.
4·16	1·545					59	Genuine, but not highly refined and containing about 5 p.c. sulphate of lime.	"
18·20			2·99			60	Genuine, but not highly refined.	"
15·08			3·70			61	"	"
2·6			0·48			62	Refined cream tartar of extra quality	"
13·78			3·15			63	Genuine, but not highly refined.	"
5·72			1·43			64	Genuine	"
16·64			5·23			65	Genuine, but not highly refined.	"

APPENDIX O.

BULLETIN No. 72.—COCOA AND CHOCOLATE.

LABORATORY OF THE INLAND REVENUE DEPARTMENT.

OTTAWA, September 15, 1900.

E. MIALL, Esq.,

Commissioner of Inland Revenue.

SIR,—I have the honour to present to you a report upon sixty-six samples of Cocoas and Chocolates which were collected throughout the Dominion in February of the present year. The work has been done by the various district analysts whose names are given in Table I, and in this laboratory. The work done in this laboratory has had special reference to an investigation of the value of the extraction method as applied to cocoas, with a view to determining the composition of the article in other respects than as to its content in fat and sugar. For the purpose of more intelligently presenting this work I have introduced Tables IV and V.

This work must be considered as a contribution to the study of methods, rather than as a completed investigation. Press of other work has prevented its being carried further, but I hope that opportunity may be given for its fuller exploitation, when next the subject of cocoa is taken up, since I think more can be made of it than is indicated here.

The samples examined comprise 27 plain (non-sugared) cocoas, and 39 sugared cocoas, or chocolates. Of the plain cocoas only three samples contain the whole of the fat normally present in the cocoa bean. The remaining 24 samples have been treated in such a way as to remove from one-fifth to about two-thirds of this fat. Since the fat of the Cocoa bean (cocoa-butter) has a high value in pharmacy, there is a great temptation to remove it from the beans before employing these in the manufacture of commercial cocoas. At the same time, it is claimed that cocoa from which a portion of the fat has been removed is a much preferable article to the normal substance, giving a more palatable solution and being more easily digested. This may be quite true, but it is certain that the removal of the fat deprives the cocoa of much of its value as a nourishing food : and the purchaser has a right to know to what extent the manufacturer has carried the removal.

Since the total aqueous extractive matter of cocoa is only about 20 to 25 per cent of its weight, a very large insoluble deposit tends to form in the cup. To prevent this subsidence manufacturers have resorted to the addition of a small proportion of starch, which gelatinizes on adding boiling water, and serves to keep the insoluble cocoa in suspension. A preferable method is to reduce the cocoa tissue, by grinding, to a very fine powder, and most of the samples now reported, shew that this precaution has been taken in preparing them.

It has been asserted that sometimes the whole of the normal fat of cocoa has been removed, prior to its being prepared for the market, and a cheaper fat substituted for the cocoa-butter in the course of manufacture. I have not found any samples in which such a substitution has certainly been made : but the low iodine absorption number obtained in samples 23, 36 and 37 tends to make them suspicious in this regard.

Nothing of an unwholesome nature has been found in any sample.

Finally, I beg to recommend that this report be published as Bulletin 72 of the series issued from this laboratory.

I have the honour to be, sir,

Your obedient servant,

A. McGILL.

Acting Chief Analyst.

TABLE I.

Serial Numbers.	Departmental Numbers.	Date of Collection.	Quantity purchased.	Price.	Name of Vendor.	Residence.	Analyst to whom sent.
		1900.		$ cts.			
1	17228*a*	Feb. 14	3 tins	0 35	Wright & Co.	Minnedosa	Prof. E. B. Kenrick.
2	17228*b*						
3	19331*a*	" 1	3 packages	0 30	James Wilson	398 Richmond, London, Ont.	Mr. F. T. Harrison.
4	19331*b*						
5	19662*a*	" 5	3 tins	0 39	Wm. Davis	Main St., Richmond, Que	Dr. M. Fiset.
6	19662*b*						
7	20657*a*	" 3	2 tins	0 26	W. Madden	141 Queen St., Ottawa	Dr. F. X. Valade.
8	20657*b*						
9	20669*a*	" 9	3 tins (¼ lb.)	0 30	M. McAuliffe	Perth, Ont.	Dr. W. H. Ellis.
10	20669*b*						
11	17229*a*	" 14	3 cakes	0 25	W. A. B. Hassell	Minnedosa	Prof. E. B. Kenrick.
12	17229*b*						
13	19670*a*	" 5	1 lb.	0 30	Elz. Turcotte	74 Defossés, Quebec	Dr. M. Fiset.
14	19670*b*						
15	20660	" 5	3 cakes (¼ lb.)	0 30	A. Sibbeth & Son	Carleton Place	Dr. F. X. Valade.
16	19668*a*	" 5	3 tins	0 30	Chabot & Drolet	271 St. Joseph, Quebec	Dr. M. Fiset.
17	19668*b*						
18	17233*a*	" 14	1 lb.	0 40	Wm. Howatt	Neepawa	Prof. E. B. Kenrick.
19	17233*b*						
20	17234*a*	" 14	3 tins	0 40	A. J. Calhoun	"	"
21	17234*b*						
22	19665*a*	" 5	3 packages	0 30	Jean P. Guy	152 St. Paul, Quebec	Dr. M. Fiset.
23	19665*b*						
24	20658	" 3	" (¼ lb.)	0 15	W. Madden	141 Queen St., Ottawa	Dr. F. X. Valade.
25	17232*a*	" 14	3 cakes	0 60	Wm. Howatt	Neepawa	Prof. E. B. Kenrick.
26	17232*b*						
27	19330*a*	" 1	3 packages (¼ lb.)	0 30	James Mills	Norwich, Ont.	Mr. F. T. Harrison.
28	19330*b*						
29	19332	" 1	" "	0 38	John Lawson	261 Dundas St., London, Ont	"
30	19667*a*	" 5	1 lb.	0 40	Chabot & Drolet	271 St. Joseph, Quebec	Dr. M. Fiset.
31	19667*b*						
32	20665*a*	" 10	3 cakes	0 36	Hunter's Grocery	Peterborough	Dr. W. H. Ellis.
33	20665*b*						
34	20670*a*	" 10	"	0 15	G. Robinson	Toronto	"
35	20670*b*						
36	19666*a*	" 5	1 lb	0 25	Jean P. Guy	152 St. Paul, Quebec	Dr. M. Fiset.
37	19666*b*						

38	19327*a*	Jan.	21	...	"	0 25	George Hasenflug	Waterloo, Ont.	Mr. F. T. Harrison.
39	19327*b*								
40	17230	Feb.	14	.	3 tins	1 00	T. J. McDermot	Minnedosa	Prof. E. B. Kenrick.
41	19669*a*	"	5	.	"	0 90	Elz. Turcotte	74 Defossés, Quebec	Dr. M. Fiset.
42	19669*b*								
43	20664	"	9	.	" ($\frac{1}{4}$ lb.)	0 75	MacKerracher	Perth, Ont.	Dr. W. H. Ellis.
44	19329*a*	"	1	.	3 packages ($\frac{1}{4}$ lb.)	6 30	S. Pitcher	Norwich, Ont.	Mr. F. T. Harrison.
45	19329*b*								
46	20663*a*	"	9	.	3 tins ($\frac{3}{4}$ lb.)	0 36	T. A. Moore	Perth, Ont.	Dr. W. H. Ellis.
47	20663*b*								
48	20661*a*	"	5	.	"	0 60	A. Sibbeth & Son	Carleton Place	Dr. F. X. Valade.
49	20661*b*								
50	20666*a*	"	10	.	2 tins (1 lb.)	0 60	P. Robinson	Peterborough	Dr. W. H. Ellis.
51	20666*b*								
52	19663*a*	"	5	.	1 lb.	0 50	Wm. Davis	Main St., Richmond, Que.	Dr. M. Fiset.
53	19663*b*								
54	20667*a*	"	10	.	3 tins (1 lb.)	0 75	J. C. Sullivan.	Peterborough	Dr. W. H. Ellis.
55	20667*b*								
56	20656*a*	"	3	.	2 tins ($\frac{3}{4}$ lb.)	0 25	A. E. Cowan	Sparks St., Ottawa	Dr. F. X. Valade.
57	20656*b*								
58	20668*a*	"	10	.	" (1 lb.)	0 60	Hargreaves Bros	Toronto	Dr. W. H. Ellis.
59	20668*b*								
60	19664	"	5	...	3 tins	0 75	H. P. Wales	Richmond, Que.	Dr. M. Fiset.
61	20662*a*	"	5	.	" ($\frac{3}{4}$ lb.)	0 30	Weekes Bros.	Carleton Place	Dr. F. X. Valade.
62	20662*b*								
63	19328	Jan.	31	.	3 packages ($\frac{1}{4}$ lb.)	0 25	George Hasenflug	Waterloo, Ont	Mr. F. T. Harrison.
64	17235	Feb.	19	.	3 cakes	0 75	A. F. Calder	Neepawa	Prof. E. B. Kenrick.
65	20655*a*	"	5	.	$\frac{1}{2}$ lb.	0 15	Cochran & Castle	Ottawa	Dr. F. X. Valade.
66	20655*b*								

TABLE II.—Non-Sugared Cocoas.

Serial Number.	Departmental Number.	Moisture.	Fat.			Ash.			Phosphoric Acid. P_2O_5.	Remarks.	Name of Brand.
			p. c.	Iodine Number.	KOH	Total.	Insol.	Sand.			
		p. c.		p. c.	p. c.	p. c.	p. c.	p. c.	p. c.		
40	17230	3·95	28·61	34·3	..	7·84	.....	.....	.. ...	Refractive index of fat—D at 23° C. 1·46306	Van Houten's Cocoa.
41	19669*a*	4·38	28·63	35·0	19·7	8·15	1·65	0·05	.. ..	cocoa, from which nearly half the normal fat	
42	19669*b*	5·20	27·28	33·7	18·2	8·20	1·88	0·05	.....	has been removed.	
43	20664	2·65	29·35	30·8	.....	8·20	1·85	0·05	1·43		
	Means	4·04	28·46	33·4	19·0	8·10	1·78	0·05	1·43		
44	19329*a*	5·17	17·38	38·5	19·6	6·80	3·89	0·35	1·33		
45	19329*b*	5·76	17·78	.. ..	20·2	.....	.....	.....	.....		
46	20663*a*	5·01	18·25	35·1	.....	6·30	3·46	0·30	.....	Cocoa, from which about two-thirds of the fat	Webb's Cocoa.
47	20663*b*	4·83	17·36	.....	.....	6·45	3·40	0·35	.....	has been removed.	
48	20661*a*	3·95	19·72	36·0	18·4	6·87	4·54	0·94	.....		
49	20661*b*	4·03	19·18	.....	19·2	6·80	3·99	0·55	1·37		
	Means	4·79	18·27	36·5	19·3	6·64	3·86	0·50	1·35		
50	20666*a*	3·15	27·14	32·8	19·2	5·00	3·50	0·10	1·37	Cocoa, from which nearly half the normal fat	Baker's Breakfast Cocoa.
51	20666*b*	4·17	27·80	.....	19·8	4·95	3·50	0·11	.....	has been removed.	
	Means	3·66	27·47	32·8	19·5	4·97	3·50	0·10	1·37		
52	19663*a*	1·87	53·25	35·1	19·2	2·85	1·27	0·05	.....	Normal cocoa.	Baker's Chocolate.
53	19663*b*	2·43	54·20	34·0	20·0	2·90	1·32	0·07	.....		
	Means	2·15	53·72	34·5	19·6	2·87	1·29	0·06	.....		
54	20667*a*	5·41	30·39	29·2	.....	6·90	2·45	0·10	.....	Cocoa, from which less than half the normal fat	Bensdorp's Cocoa.
55	20667*b*	5·20	31·34	.....	.....	6·75	2·05	0·10	.....	has been separated. Contains no foreign	
56	20656*a*	6·34	30·99	32·8	19·2	6·75	1·89	0·06	.....	starch.	
57	20656*b*	5·22	30·87	34·0	20·1	6·80	1·95	0·05	.....		
	Means	5·54	30·90	32·0	19·7	6·80	2·08	0·08	.....		

58	20668*a*	3·29	36·10	33·6	.....	4·65	3·05	0·40	.....	Cocoa, from which about one-third the normal Huyler's Cocoa.
59	20668*b*	3·85	36·79	.....	.....	4·60	3·00	0·42	.....	fat has been separated.
	Means	3·57	36·45	33·6	.....	4·62	3·02	0·41	.....	
60	19664	7·00	30·51	34·3	19·5	4·87	1·47	0·05	.....	
61	20662*a*	6·21	33·92	33·3	18·9	4·55	1·05	0·06	.....	Cocoa, from which about one-third the normal Cowan's Cocoa.
62	20662*b*	5·35	35·07	.....	.....	4·55	1·00	0·05	.....	fat has been removed.
63	19328	5·61	33·32	35·0	19·9	4·48	1·30	0·10	1·130	
	Means	6·04	33·20	34·2	19·4	4·61	1·20	0·06	1·130	
64	17235	2·53	55·93	34·9	.....	2·67	.....	.....	.....	Contains a trace wheat starch; otherwise normal. Lion Brand Cocoa.
65	20659*a*	3·08	43·41	33·8	19·6	2·83	1·42	0·03	.....	Appear to have had a portion (one-fifth) of the Cocoa nibs.
66	20659*b*	3·63	44·62	.....	.....	2·85	1·45	0·03	.....	normal fat separated.
	Means	3·35	44·02	33·8	19·6	2·84	1·43	0·03	.....	

NOTE.—The high percentage of ash found in certain of the above samples is probably due to the use of a fixed alkali in the preparation of the cocoa. The Holland cocoas are generally prepared in this way, and it is claimed that the treatment renders them more digestible. This claim has, however, been disallowed by several scientists, and the question may be said to be, as yet, an unsettled one.

TABLE III.—Sugared Cocoas.

Serial Number.	Departmental Number.	Moisture.	Sugar.		Fat.		Ash.			Phosphoric Acid, P_2O_5.	Remarks.	Name of Brand.
			Reducing.	Cane.	p. c.	Iodine Number	KOH.	Total.	Insol.	Sand.			
		p. c.	p. c.	p. c.		p. c.	p. c.	p. c.	p. c.	p. c.	p. c.		
1	17228*a*	5·48	R.	25·87	25·83	34·6	..	1·51	..	.....	..	Contains arrowroot starch. Refractive index of fat—D at 23° c. = 1·46330.	Epps' Cocoa.
2	17228*b*	4·43	1·05	24·63	26·85	..	.....	..	..	..	..		
3	19331*a* ..	4·70	None.	27·60	25·64	34·8	19·7	1·50	0·85	0·08	0·47		
4	19331*b*	4·73	1·17	27·01	25·99	..	..	..	..	..	..		
5	19662*a* ..	4·21	None.	28·31	27·50	34·1	19·3	1·50	0·55	0·03	...		
6	19662*b*	4·21	0·89	26·12	27·02	34·0	....	1·45	0·65	0·05			
7	20657*a* ..	3·97	1·07	24·22	26·44	33·7	19·4	1·41	0·75	0·03	....		
8	20657*b*	4·30	1·25	26·76	26·77	34·0	..	1·45	0·55	0·03	...		
9	20669*a* ..	4·41	None.	28·12	27·85	32·5	.	1·45	0·95	0·05	.....		
10	20669*b* ..	3·88	2·54	21·33	27·03	.. ..	..	1·45	0·90	0·05	.....		
	Mean	4·43	1·33	26·00	26·69	34·0	19·5	1·47	0·74	0·05	0·47		
11	17229*a* ..	2·07	R.	53·58	19·32	57·1	.	0·86	..	..	..		
12	17229*b*.	2·74	1·84	51·60	17·92	.. ..	.	.	..	.....	.....		
13	19670*a* ..	1·93	0·87	54·27	18·30	.. ..	..	0·80	0·35	0·01	.....	Contains some wheat starch.	Fry's Diamond Chocolate
14	19670*b*. ..	2·30	0·88	55·54	18·68	33·3	..	0·81	0·54	0·06	.....		
15	20660.....	2·64	0·88	49·65	20·92	34·8	19·1	0·81	0·54	0·06	.....		
	Means .	2·34	1·12	52·91	19·03	35·1	19·1	0·82	0·48	0·04	...		
16	19668*a*	3·62	None.	38·76	15·13	33·3	19·9	1·87	0·75	0·02	....		Fry's Homeopathic Cocoa.
17	19668*b*. ..	3·79	1·19	39·55	14·80	35·0	.	1·90	0·80	0·03	.. ....		
	Means	3·70	1·19	39·16	14·97	34·2	19·9	1·88	0·77	0·02	.....		
18	17233*a*	5·04	R.	28·61	9·65	36·6	..	2·48	....	.....	.. ....		
19	17233*b*....	5·56	2·10	30·59	9·28	.....	..	.. ..	..	.. ..	.....	Contains wheat starch ...	Galt's Blue Ribbon Cocoa.
20	17234*a*	5·46	R.	32·80	12·39	34·9	.	1·84	..	....	.....		
21	17234*b*	5·23	3·12	28·18	11·74	.. ..	.....	.....	...	..	.....		
	Means	5·32	2·61	30·04	10·77	35·7	.....	2·16	....	.	... .		

22	19665*a*	3·91	1·45	47·00	13·18	.....	18·3	2·30	0·63	0·02	.....		Cowan's "London Pearl Cocoa.
23	19665*b*	3·83	1·07	51·44	12·72	26·8	.....	2·30	0·65	0·02	.....		
	Means	3·87	1·26	49·22	12·95	26·8	18·3	2·30	0·64	0·02	.....		
24	20658	0·78	1·20	46·28	23·20	33·8	19·0	1·17	0·58	0·06	.....		Cowan's Diamond Chocolate
25	17232*a*	2·85	R.	26·26	31·88	35·3	.....	2·62	.....	.....	.....	A little wheat starch	Mott's Chocolate Compound
26	17232*b*	1·47	2·53	60·97	21·16	.....	.....	.....	.....	.....	.....		
27	19330*a*	1·04	None.	62·00	20·83	32·0	20·0	1·12	0·65	0·08	0·33		Mott's Diamond Chocolate.
28	19330*b*	1·46	1·71	61·69	21·29	.....	.....	.....	.....	.....	.....		
	Means	1·32	1·41	61·55	21·09	32·0	20·0	1·12	0·65	0·08	0·33		
29	19332	1·44	None.	61·20	20·10	34·8	19·8	1·44	0·98	0·08	0·57		
30	19667*a*	0·83	2·08	58·50	20·90	34·4	19·3	1·50	0·65	0·02	.....		Chocolat Menier.
31	19667*b*	1·51	1·93	58·47	20·45	34·2	18·9	1·45	0·60	0·02	.....		
	Means	1·26	2·00	59·72	20·48	34·5	19·3	1·46	0·74	0·04	0·57		
32	20665*a*	1·37	None.	56·12	27·08	31·3	18·9	1·30	0·85	0·05	0·46		Cadbury's Chocolate.
33	20665*b*	1·34	2·01	55·15	26·49	.....	.....	1·30	0·80	0·05	.....		
	Means	1·35	2·01	55·63	26·78	31·3	18·9	1·30	0·82	0·05	0·46		
34	20670*a*	1·58	None.	63·75	23·80	32·3	.....	1·10	0·75	0·07	.....		Baker's German Chocolate.
35	20670*b*	1·37	3·07	56·64	23·00	.....	19·0	1·15	0·75	0·06	.....		
	Means	1·47	3·07	60·20	23·40	32·3	19·0	1·12	0·75	0·06	.....		
36	19666*a*	5·20	Trace.	26·00	23·15	20·1	20·6	1·80	0·90	0·10	.....	Iodine number for fat is too low, and points to the presence of foreign fat.	Thomas' Chocolate.
37	19666*b*	5·43	"	21·30	23·38	25·7	15·2	1·85	0·90	0·99	.....		
	Means	5·31	Trace.	23·65	23·26	22·9	17·9	1·82	0·90	0·09	.....		
38	19327*a*	3·11	None.	41·80	17·08	35·8	19·8	1·64	0·41	0·05	0·308	Contains some maize starch	Bulk Cocoa.
39	19327*b*	4·59	4·93	36·53	18·30	.....	.....	.....	.....	.....	.....		
	Means	3·85	2·56	39·17	17·69	35·8	19·8	1·64	0·41	0·05	0·308		

TABLE IV.

A study of the water extractive of Cocoas. The samples were first dried and freed from fat.

Sugared Cocoas.

Serial Number.	Extraction by Water at 80° C.			Total Sugar.	Excess Non-sugar Extractive.	Non-sugar Extractive as percentage on Dry Fat and Sugar free Substance.	Remarks.
	1st 500cc.	2nd 500cc.	Total Extractive.	See Table III.			
2	30·22	1·84	32·06	25·68	6·38	14·9	Epps' Cocoa: Arrowroot starch is present in considerable amount.
4	33·47	3·07	36·54	28·18	8·33	20·2	
6	31·97	2·29	34·26	27·01	7·25	17·4	
8	32·64	3·54	36·18	28·01	8·17	20·0	
10	32·77	2·22	34·99	23·87	11·12	24·6	
12	57·06	0·60	57·66	53·44	4·22	16·3	Fry's Diamond Chocolate: Contains some wheat starch.
14	57·45	1·16	58·61	56·42	2·19	9·8	The extraction is apparently incomplete in 14.
17	43·64	1·72	45·36	40·74	4·62	11·4	Blue Ribbon Cocoa: Contains wheat starch.
19	39·40	2·04	41·44	32·69	8·75	16·9	
21	39·30	3·51	42·81	31·30	11·51	22·2	
23	57·71	1·75	59·46	52·51	6·95	22·4	
26	66·40	0·70	67·10	63·50	3·60	25·9	
28	66·62	0·65	67·27	63·40	3·87	27·9	
31	65·73	1·10	66·83	60·40	6·43	36·1	Chocolat Menier: Contains no added starch.
33	58·84	1·05	59·89	57·16	2·73	18·2	Extraction apparently incomplete. See Table V.
35	64·02	0·91	64·93	59·71	5·22	32·8	Bakers' German Chocolate: Contains no added starch.
37	25·72	2·37	28·09	21·30	6·79	13·6	
39	46·70	0·89	47·59	41·46	6·13	17·2	Contains maize starch.

Non-Sugared Cocoas.

42	18·77	5·10	23·87			35·3	None of these samples contain foreign starch. If we assume that the smaller non-sugar extractive, as calculated to a percentage on the dry fat and sugar free substance, obtained with the samples tabulated above, is due to the presence of starch or other ingredient, yielding nothing to water, the percentage of such ingredient present may be approximated by the formula, $x = 34.5 - a$, where x = percentage of ingredient, and a = percentage of extractive found, and calculated as above. On this assumption, Nos. 31 and 35 are the only sugar-containing cocoas which are quite free from added starch, and the amount present in other samples varies from about 5 to more than 20 per cent.
45	20·78	6·14	26·92			35·2	
47	16·23	10·63	26·86			34·5	
49	20·30	4·58	24·88			32·4	
51	19·28	4·56	23·84			35·0	
53	13·30	2·52	15·82			36·3	
55	17·93	4·43	22·36			35·2	
57	16·09	4·39	20·48			32·0	
59	15·69	3·70	19·39			32·6	
62	18·85	3·60	22·45			37·6	
66	13·72	3·59	17·31			33·4	
					Mean..	34·5	

TABLE V.

A study of Alcohol extraction, followed by Water extraction, on dry and fat free Cocoas.

Sugared Cocoas.

Serial Number	Extractive by Alcohol. S. g. 0·815	Subsequent Extraction by 500cc. Water at 80° C.	Sum.	Difference between Alcohol Extractive and total Sugar. (See Table IV.)	Difference between Alcohol and Water Extraction, and Water Extractive. (See Table IV.)	Remarks.
	p. c.	p. c.	p. c.	p. c.	p. c.	
2	27·69	4·49	32·18	2·01 excess	0·12 excess	The treatment with alcohol removes a little more (in four cases a little less, mean= 1·31 p.c.) than the sugar, the mean excess being 1·58 p.c. The total extractive is a little less (in three cases a little more, mean=0·43) than that by the double water treatment, the mean deficiency being 1·20 p.c.
4	29·25	5·75	35·00	1·07 "	1·51 deficiency	
6	27·95	4·94	32·89	0·94 "	1·37 "	
8	28·21	4·88	33·09	0·20 "	3·09 "	
10	28·07	5·57	33·64	4·20 "	1·35 "	
12	54·32	2·75	57·07	0·88 "	0·59 "	In view of the large extractive by alcohol in non-sugared cocoas (*vide infra*), the fact of sugar only being extracted in this series, by alcohol, is surprising. There can be little doubt that a longer continuation of the alcohol treatment would have taken soluble matter other than sugar.
14	55·52	3·37	58·89	0·90 deficiency	0·28 excess	
17	39·83	5·16	44·99	0·91 "	0·37 deficiency	
19	34·25	6·58	40·83	1·56 excess	0·61 "	
21	36·40	3·43	39·83	5·10 "	2·98 "	
23	50·19	6·53	56·72	2·32 deficiency	2·74 "	
26	64·34	2·65	67·99	0·84 excess	0·89 excess	
28	63·89	2·79	66·68	0·49 "	0·59 deficiency	
31	63·02	3·24	66·26	2·62 "	0·57 "	
33	56·06	3·18	59·24	1·10 deficiency	0·65 "	
35	60·67	3·41	64·08	0·96 excess	0·85 "	
37	22·50	4·83	27·33	1·20 "	0·76 "	
39	42·54	5·02	47·56	1·08 "	0·03 "	

Non-Sugared Cocoas.

42	9·05	13·93	22·98	. . . . .	0·89 deficiency	Two treatments with water (as in Table IV) secure a more complete extraction of dry cocoa tissue than a treatment with alcohol followed by one with water, but the difference is not great, and three samples appear to be exceptions to this generalization. The average excess given by alcohol-water treatment in these cases is 1·35 p.c., whereas the average excess given by the double-water treatment in the remaining eight cases is 2·39 p.c.
45	10·75	10·25	21·00	. . . .	5·92 "	
47	10·54	14·18	24·72	. . . . .	2·14 "	
49	13·04	13·13	26·17	. . . . .	1·29 excess	
51	12·28	8·32	20·60	. . . . .	3·24 deficiency	
53	7·36	7·16	14·52	. . . . .	1·32 "	
55	8·95	12·74	21·69	. . . . .	0·67 "	
57	9·37	12·27	21·64	. . . . .	1·16 excess	
59	9·26	8·37	17·63	. . . . .	1·76 deficiency	
62	9·38	9·90	19·28	. . . . .	3·17 "	
66	11·26	7·66	18·92	. . . . .	1·61 excess	

TABLE VI.

REDUCING substances (to Fehling) present in non-sugared Cocoas, expressed as Dextrose.

Serial Number.	Apparent Dextrose.	Apparent Dextrose after Acid Treatment.	Increase by Acid Treatment.	Remarks.
42	1·55	3·06	1·51	The substances, present in normal cocoas, which reduce Fehling's solution, calculate to about 2 per cent as dextrose, and their presence will produce a certain error in the estimation of reducing sugar in cocoa. Where cane sugar is present as a diluent to about 50 per cent, this error calculated upon the whole sample. will amount to about 1 per cent; and it is probable that the numbers appearing in the column head "reducing sugar" in Table III. are about this much in excess of the truth.
45	2·16			
48	3·61			
49	2·90			
51	3·31			
52	2·08			
53	1·15			
55	2·04			
56	0·28	1·41	1·13	
57	1·51	2·19	0·68	
59	2·16			
60	2·91	0·93	0·30	It is probable that no reducing sugar has been purposely added to any of these samples, the small amounts found being sufficiently accounted for by traces of invert sugar produced from the cane sugar used.
61	0·63			
62	3·22			
65	2·39			
66	2·79			
Mean.....	2·04		0·90	The mean dextrose indicated in the sugared cocoas examined is 1·46 per cent; and since the mean cane sugar present is 50 per cent, the reducing sugar calculated upon the cocoa tissues present, will be about $2 \times 1{\cdot}46 = 2{\cdot}92$ per cent. It appears, therefore, that not more than about 1 per cent of reducing sugar is actually present in these cocoas.

APPENDIX P.

BULLETIN No. 73.—CLOVES.

LABORATORY OF THE INLAND REVENUE DEPARTMENT.
OTTAWA, October 19, 1900.

E. MIALL, ESQ.,
Commissioner of Inland Revenue.

SIR,—On July 21, 1899, the High Commissioner for Canada addressed a letter to the Honourable the Minister of Inland Revenue calling his attention to representations which had been made, in a letter to Lord Strathcona, by a firm of wholesale grocers of the highest repute in London regarding the inferior and adulterated quality of the spices allowed to be sold in the Dominion. Attention was particularly directed to samples of so called cloves, which consisted mainly of the exhausted article, that is of clove stalks and stems, without the flower buds, which constitute the most valuable part of the spice. Both of these varieties of samples were said to have a certain amount of genuine or whole cloves mixed with them, but it was asserted that, nevertheless, the mixtures were such as would be condemned under the adulteration laws of Great Britain. The firm in question appealed to Lord Strathcona to give his powerful assistance towards causing an investigation to be made into the way in which the adulteration laws of Canada are enforced, especially in the case of spices, and assured him that, under the existing state of things, no respectable merchant in Great Britain could compete in endeavouring to secure orders from Canada.

In consequence of these representations, and in accordance with your permission, 19 samples of whole and 22 samples of ground cloves were collected in the Maritime Provinces and in the provinces of Quebec and Manitoba in September, 1899, and submitted to the various district analysts for examination. Of these, 15 samples of ground cloves and 3 samples of whole cloves were found to be adulterated or deficient in volatile oil, and proceedings were taken against several of the vendors of the samples which were reported as containing less than 12 p.c. Subsequently it was found that investigation was necessary both with reference to a standard, as regards the proper quantity of volatile oil which genuine cloves ought to contain and also as to the methods of analysis to which the various samples should be subjected.

This investigation has been carried out in the most thorough manner by my assistant Mr. A. McGill, B.A., and his results are contained in the note on cloves dated July 3, and a report on the 18th inst., both of which are subjoined hereto. I beg to recommend their publication, as well as that of the present report, in order that the subject may be better understood by the trade and the public, and in order also that, when you cause another collection of clove samples to be made, the district analysts may use in their examinations, if so minded, Mr. McGill's very excellent suggestions.

I have the honour to be, sir,
Your obedient servant,

THOMAS MACFARLANE,
Chief Analyst.

NOTE ON CLOVES.

Cloves (clous de girofle) are the flower buds of Eugenia Caryophyllata, a tree which is indigenous to the Moluccas, but which has been introduced into Zanzibar, Cayenne, and elsewhere. Cloves are known in commerce as East Indian, African or American, and their market value decreases in this order.

The value of the clove is due to the volatile, or so-called essential oil which it countains, and the accurate determination of this volatile oil is the most important means of ascertaining the quality of a given sample of cloves. Besides the volatile oil, the determination of fixed oil, moisture, ash and carbohydrates, afford useful data for the valuation of this spice.

The only published analyses of cloves which have come under my notice are those of Clifford Richardson of Washington, contained in Bulletin 13 of the Department of Agriculture, Part II, p. 225, issued in 1887. These analyses have been copied by König (Nahrungs und Genussmittel, p. 744), with the addition of that of a single sample supplied by a druggist of Münster, and again by V. Gerin (Encyclopédie Chimique, Tome X, p. 657). So far as these analyses deal with whole cloves, presumably genuine, they show the following results:—

Description of the Sample.	Volatile Matter.			Fixed oil.	Total extraction.	Ash.
	Water.	Volatile oil.	Total.			
Guaranteed cloves purchased from Washington Grocers. . .	6·95	16·35	23·30	7·12	30·42	5·99
Whole cloves purchased from druggists, Washington.....	3·98	16·61	20·59	9·72	30·31	9·31
do do	5·96	10·23	16·19	9·94	26·13	7·66
do do	2·90	15·87	18·77	10·07	28·84	13·05
Extra quality cloves.....	8·67	17·94	16·61	9·54	36·15	7·72
Amboyna cloves.....	8·78	18·89	27·67	10·24	37·91	5·25
Singapore cloves	10·67	13·52	24·19	9·95	34·14	5·50
Means...	6·84	15·63	22·48	9·51	31·99	7·78

From this it appears that *moisture* in cloves may vary from 2·90 per cent to 10·67 per cent: the volatile oil from 10·23 per cent to 18·89 per cent; the fixed oil from 7·12 per cent to 10·24 per cent. and the ash from 5·25 per cent to 13·05 per cent. The Münster sample quoted by König must have been altogether abnormal as it contained 16·39 per cent of water. Fluckiger (quoted by C. Richardson) states that the volatile oil varies from 16 to 20 per cent. Dietsch gives the following as the percentage of oil (volatile ?) to be expected in cloves from different sources:—

Amboyna.....	16 to 21 per cent.
Zanzibar.....	12 to 17 "
Cayenne.....	9 to 12 "

Owing to the difficulty of exactly determining the moisture as distinct from the volatile oil, I prefer to rely upon the sum of these two percentage numbers; and have introduced into the following table a number under the heading *total volatile matter*. In order to check any excess of moisture, which might be added fraudulently, I dry the sample, to constant weight, at the ordinary temperature, over strong sulphuric acid.

The number so obtained I have not found to exceed 5·85 per cent, and I am forced to believe that much of the so-called *water* found in analytical results includes more or less volatile oil. The number for total volatile matter found by Richardson, varies from 16·19 to 27·67 per cent, and averages 22·48 per cent.

The principal adulteration of cloves results from one or other of the following :—

1. Extraction of the whole or part of the volatile oil.
2. Introduction of stems.
3. Addition of cheaper spices or other foreign matter. This last sophistication is very common with ground cloves, and pimento (allspice) is the substitute generally added.

It is evident that the microscope must be used for detection and identification of foreign tissues ; and since cloves contain no starch the intermixture of pimento is easily detected.

Exhausted cloves are easily recognized, when whole, by their striated and shrivelled appearance ; but when ground, the only way of ascertaining their appearance is a chemical analysis. The very wide range of percentage for volatile oil, makes it desirable that some minimum limit for this component should be fixed by law ; unless, indeed, cloves are sold under a distinctive name, such as East Indian, American, etc., and a standard be understood or fixed for each kind. In the meantime, it is evident that while a sample containing as little as 9 per cent volatile oil may be described as of very poor quality, it cannot be held to be adulterated. It is very desirable that a study of cloves as found in the Canadian market should be made, and, if possible, a minimun for volatile oil fixed by law.

I have appended to this memorandum a synoptical study of certain (49) samples recently examined by the public analysts, as well as some analytical data obtained by myself.

GROUND CLOVES.

Serial Number.	Departmental Number.	Moisture.	Volatile Oil.	Total Volatile Matter.	Fixed Oil.	Total Extraction.	Ash.	Remarks by Analyst.	Analyst.
7	17194	6·28	3·24	9·52	6·92	16·44	4·09	Adulterated, mainly pimento....	Kenrick.
8	17195	6·32	15·33	21·65	3·31	24·96	5·69	" def. in ess. oil.....	"
10	17197	6·34	11·42	17·06	3·35	21·11	7·12	" " "	"
11	17198	6·70	11·32	18·02	3·27	21·29	6·89	" " "	"
13	17200	5·82	11·70	17·52	3·23	20·75	6·66	" " "	"
	Means...	6·29	10·60	16·89	4·02	20·91	6·09	Including No. 17194.	
		6·30	12·44	18·74	3·29	22·03	6·59	Excluding No. 17194.	
32	19597	7·30	11·85	19·15	6·95	23·10	9·36	Adulterated with allspice.....	Fiset.
33	19598	5·85	14·00	19·85	6·36	26·21	6·10	Genuine.....	"
36	19601	6·00	14·00	20·00	5·40	25.40	5·98	Wheat starch, adulterated.	"
37	19602	5·10	17·55	22·65	6·70	29·35	6·40	Genuine	"
40	19605	7·60	7·50	15·10	7·20	22·30	5·82	Adulterated with stems, &c	"
	Means...	6·97	11·12	18·08	6·52	23·60	6·05	Omitting 19598 and 19602.	
2	16736	11·22	12·00	23·22			6·76	Deficient in vol. oil...	Bowman.
4	16739	10·75	11·32	22·07			6·37	" " "	"
16	17677	10·72	14·48	25·20			6·83	Genuine	"
17	17678	10·58	13·72	24·30			6·49	Deficient in vol. oil.....	"
19	17682	10·67	12·19	22·26			6·52	" " "	"
20	17683	10·89	19·32	30·21			5·71	Genuine.....	"
	Means...	10·66	12·31	22·96			6·54	Omitting 17677 and 17683.	
21	19575	9·34	8·32	17·66	2·03	19·69	7·06	Adulterated	Edwards.
22	19576	6·68	14·71	21·39	0·94	22·33	7·00	Genuine	"
24	19578	10·98	5·27	16·25	3·73	19·98	8·85	Adulterated	"
	19585	12·09	7·13	19·22	2·11	21·33	8·33	"	"
41	19606	9·69	11·03	20·72	1·61	22·33	5·84	Genuine	"
		10·80	6·91	17·71	2·62	20·33	8·08	Omitting 19576 and 19606.	
42	20141	5·60	4·04	9·64	9·26	18·90	6·04	Poor quality	Fagan.
3	20142	6·20	10·05	16·25	7·62	23·87	5·87	Genuine.....	"
4	20145	8·10	2·90	11·00	11·82	22·82	7·37	Adulterated	"
46	20156	7·10	9·24	16·34	9·08	25·42	5·03	Genuine	"
Clifford Richardson, 1887.		8·56	8·92	17.48	5·90	23·38	7·67		

WHOLE CLOVES.

Serial Number.	Departmental Number.	Moisture.	Volatile Oil.	Total Volatile Matter.	Fixed Oil.	Total Extraction.	Ash.	Remarks by Analyst.	Analyst.
6	17193	5·73	18·29	24·02	2·99	27·01	6·16	3·75 per cent stems, genuine.....	Kenrick.
9	17196	6·76	16·95	23·71	2·93	26·64	6·27	7·36 " " adulterated.	"
12	17199	5·91	17·34	23·25	3·08	26·33	6·22	1·38 " " genuine	"
14	17201	6·36	17·86	24 25	2·97	27·22	5·71	2·38 " " "	"
15	17202	6·73	16·85	23·58	2·86	26·44	6·38	9·27 " " adulterated.	"
	Means...	6·30	17·46	23·76	2·97	26·73	6·15		
31	19596	7·35	11·15	18·50	6·05	24·55	6·62	Stems and dirt, genuine.....	Fiset.
34	19599	10·10	11·55	21·65	6·90	28·55	6·00	Genuine.....	"
35	19600	5·05	15·70	20·75	6·90	27·65	5·62	"	"
38	19603	8·20	15·25	23·45	7·95	31·40	5·80	"	"
39	19604	8·05	12·90	20·95	7·30	28·25	5·96	"	"
	Means...	7·75	13·31	21·06	7·02	28·08	6 00		
1	16733	10·95	15·56	26·51	. ..	.....	7·12	Genuine.....	Bowman.
3	16738	11·80	16·89	28·69	.....	.....	6·02	"	"
5	16742	15·21	10 69	25·90	....	.....	6·26	Deficient in vol. oil.....	"
18	17680	11·05	19·63	30·68	.....	.....	6·38	Genuine.....	"
		12·25	15·70	27·94	.....	.....	6·45		
23	19577	9·95	9·35	19·30	1·25	20·56	5·85	Genuine.....	Edwards.
25	19579	10·99	8·51	19 50	1·99	21·49	7·42	Genuine, but low quality.....	"
26	19580	10·08	16·00	26·08	2·55	28·63	6·60	Genuine	"
27	19582	10·68	15·02	25·70	1·85	27·55	5·90	"	"
28	19583	8·62	15·03	23·65	2·78	26·43	6·99	"	"
29	19584	8·31	14·74	23·05	2·04	25·09	6·71	Genuine, clove stalks numerous. .	"
		9·77	13·11	22·88	2·08	24·96	6·58		
45	20148	6·30	12·78	19·08	10·23	29·31	6·91	Genuine.....	Fagan.
47	20151	8·42	11·16	19·58	9·16	28·74	5·51	"	"
48	20154	8·36	13·00	21·36	9·12	30·48	5·99	"	"
49	20155	8.49	6·93	15·42	8·07	23·49	4·96	Poor quality.....	"
		7·89	10·97	18·86	9·14	28·00	5·84		
Clifford Richardson, 1887.		8·04	15·80	23·84	9·10	32·94	7·42	Bull. 13, Dept. Agriculture, Washington.	
McGill.....		.....	.....	24·32	.....	31 54	.....	Amboyna cloves.	
"		....	.....	23·72	. .. .	32·04	.....	Zanzibar.	
"		. ..	...	13·94	.....	21·48	. ...	Separated stems.	
"				9·46	10·60	20·06	....	Exhausted cloves.	
"				9·47	11·54	21·01			

The following work was done on samples of Amboyna and Zanzibar cloves, obtained from Cochrane & Co., Ottawa ; and stems separated from these samples. Also, a sample of Exhausted Cloves entered at Hamilton Custom House.

Method.	Amboyna.	Zanzibar.	Stems.	Exhausted cloves.	Remarks.
1. Heated to 100° in a current of dry air condensing the volatile product loss	...	13.79	.....	.....	Result unsatisfactory.
Weight of condensed material	.....	9.45	.....	.....	
2. Dried over H_2S0_4 at ordinary temperature, to constant weight	4.72	5.85	.....	.....	Dried 54 and 30 hours respectively.
3. Dried in water oven, over night	20.08	20.88	13.94	9.46	Volatile matter.
Subsequent extraction by ether	11.46	11.16	7.54	10.60	Fixed oil, &c.
Sum	31.54	32.04	21.48	20.06	Total extractive.
4. Volatile oil by difference (3 and 2)	15.36	15.03	.....	.....	
5. Extraction of sample by ethyl ether	30.72	30.09	22.20	19.67	By loss.
Extractive dried 48 hrs. ord. temp.	23.58	22.28	7.61	.....	
6. Sample soaked in petrol. ether in glass dish, then dried at 100° C	20.72	21.52	.....	9.47	Is an improvement in the method of estimating total volatile matter
Treatment repeated	22.80	23.42	.....	.....	
" again repeated	24.32	23.72	.....	.....	
Subsequent extraction by ether	.....	.....	.....	11.54	
7. Maximum value for volatile oil, by difference (6 and 2)	19.60	17.87	.....	.....	Maximum value for vol. oil.
8. Dried as in (6) but using ethyl ether	20.50	18.36	.....	.....	Resin dries on sides of glass.
9. Ash	5.82	5.90	.....	8.20	
Sand	0.10	0.18	.....	0.46	

The foregoing is to be considered as a contribution to our yet imperfect methods for valuation of this spice. It requires yet a great deal of experimental work to make our methods all that can be desired ; and I would respectfully suggest that the requisite work be done upon specially collected samples, so that at the same time we may be able to determine the average character of cloves as imported into Canada. This determination might afford the necessary data for fixation of a standard in regard to volatile oil.

I have drawn up a circular letter, addressed to importers of spices—a copy of which is herewith submitted—and I would ask your sanction for it, as likely to sucure us the kind of samples which we need for the purpose mentioned.

Respectfully submitted,

July 4, 1900. A. McGILL.

(*See draft of letter on page 167.*)

LABORATORY OF THE INLAND REVENUE DEPARTMENT,
OTTAWA, October 18, 1900.

THOS. MACFARLANE, Esq., F.R.S.C.,
Chief Analyst.

SIR,—On July 4 last I had the honour, as acting Chief Analyst, to submit a memorandum on the subject of *Cloves* to the Commissioner of Inland Revenue. I found that, although a considerable amount of work had been done by the public analysts, and in this laboratory, I could not come to a final decision regarding the character of the samples collected by order of the Commissioner in September and October of last year; and this for two reasons, viz:—The absence of any authoritative standards of comparison, and the very varying and often questionable methods of analysis.

With regard to the first of these difficulties, I made a suggestion that samples of whole cloves should be obtained direct from importers and examined with a view to determining standard values for certain constants, by which constants it might be possible to judge the genuineness or otherwise of commercial cloves. I am now able to place before you the results of analysis of 28 samples obtained in this way. Most of the samples were accompanied by explanatory notes, and in consequence of this it has been possible for me to arrange them in three classes, representative of (1) Penang, (2) Amboyna, and (3) Zanzibar cloves. In addition to this general classification, I have placed a value upon certain physical characters such as colour, size, etc., and have found that the perfection of the sample in these respects bears a definite relative value as indicated by chemical analysis.

Regarding methods of analysis, I can only claim to have improved these in one point, but that an important one, viz., the distinction between the two volatile proximate principles of cloves, moisture and volatile or essential oil. A very cursory examination of such recorded results of work on cloves as are available suffices to show that the analyst has found it little more than guesswork to say when, during the exposure of the ground sample to a drying atmosphere, water vapour ceases to come off and essential oil is volatilized. The matter is one of great importance, since the value of a given sample of cloves is principally dependent upon the percentage of volatile oil it contains, while the amount of water is a variable quantity, depending on the conditions under which the sample has been kept. For this reason, the value of the sample cannot be judged from the total loss of weight it sustains on being dried at 100° C. The fraction of this loss due to water may be increased by judicious treatment in such a way as to make good a very considerable abstraction of volatile oil. I have found that, on exposure of the ground sample to a very much reduced pressure (about 60 millimetres of mercury) over sulphuric acid, the vapour tensions of water and the volatile oil of cloves are so adjusted at ordinary temperatures that the whole of the

aqueous vapour is absorbed by the sulphuric acid in about 24 hours, while not more than traces of essential oil are lost. This is evidenced by a study of the following experimental numbers :—

Hours Exposure	Percentage Loss of Weight.							Remarks.
	(*a*)	(*b*)	(*c*)	(*d*)	(*e*)	(*f*)	Means.	
24	5·1	5·2	. . .	. . .	. . .	. . .	5·15	Acid scarcely discoloured.
48	5·4	5·7	5·5	4·6	5·1	4·8	5·15	Acid distinctly brown.
72	5·8	6·1	5·8	5·1	5·2	5·3	5·55	Acid more distinctly brown.
96	. . . .	. . . .	7·3	6·1	7·1	6·3	6·70	Acid very markedly brown.
120	7·9	8·2	. . .	. . . . .	. . . . .		8·05	Acid very dark brown.
144	8·6	9·2	. . . . .	. . . . .			8·90	Acid very dark brown.
	Desiccator No. 1.		Desiccator No. 2.					

It will be seen that a large loss of weight occurs during the first 24 hours, which is scarcely increased during the next 24 hours. The vapours coming off during this time are absorbed by the sulphuric acid without discolouring it, in other words, but faint traces of volatile oil are present. A further exposure of 24 hours but slightly increases the percentage of volatile matter lost, but this slight increase produces a very marked discoloration of the acid, and this blackening of the acid by absorption of organic matter with decomposition continues to proceed, although but slowly, indicating that the further loss of weight is entirely due to volatile oil. I found that at the end of 16 days the total loss amounted to 11·45 per cent. The advantage of treating the sample *in vacuo* is two fold : 1st, the drying proceeds more rapidly than at the ordinary atmospheric pressure. 2nd, the reduction of pressure affects the vapour tension of water vapour much more than that of essential oil of cloves. I found that under ordinary pressure this same sample of cloves lost only (a) 3.30, (b) 3·75, (c) 3·90, mean = 3·65 per cent of weight in 23 hours ; and (a) 4·10, (b) 4·60), (c) 5·45, mean = 4·72 per cent in 54 hours. There was no marked colouration of the acid in the experiment conducted at ordinary pressure ; so that it is probable that no great error in estimating moisture would be involved in leaving the sample over sulphuric acid until constant weight (or nearly so) had been reached ; but this would require at least 2½ to 3 days in the sample quoted. In six samples treated in two desiccators of similar form, placed side by side, one being under ordinary pressure (760 mm.) the other under only 60 mm. mercury, the following results were obtained for six hours :—

LOSS OF WEIGHT PER CENT.

	1.	2.	3.	4.	5.	6.
Reduced pressure.....	5 65	6·25	5·7	6·5	6·45	6·15
Ordinary pressure.....	4·65	5·15	4·65	4·85	4·95	5·20
Difference	1·00	1·10	1·05	1·65	1·50	0·95

The total volatile matter (sum of moisture and volatile oil) is obtained by exposing the sample to a temperature of 98° C. for 24 hours. A possible improvement in this determination consists in the previous treatment of the sample with re-distilled petroleum ether, in the same capsule in which the ultimate drying is effected. To the capsule, containing a weighted quantity (2 grammes) of the sample, is added 25 cc. ether. This is allowed to stand for several hours at the ordinary temperature, during which time the ether takes the fatty matter and oils into solution, and the solvent gradually volatilizes. On drying in the oven, the volatile oil is more rapidly separated than when no ether treatment is given.

Three samples gave the following results :—

	(1)	(2)	(3)
After ether treatment	20·72	21·52	9·47
Without ether	20·08	20·88	9·46
Differences	0·64	0·64	0·01

On repeating the treatment with ether a further loss of weight occurred, as follows :—

	(1)	(2)
Second treatment with ether and drying	23·86	23·42
Increased loss on second treatment	3·14	1·90
Third treatment with ether	24·32	23·72
Increased loss on third treatment	0·46	0·30

This seems to indicate that the ordinary mode of determining total volatile matter does not suffice to get rid of all the volatile oil, but that a 48-hour treatment is needed, even when the oil is freed from the cellular tissue by the use of a solvent. In this case the numbers given for volatile oil in the appended tables will be about 2 per cent too low, a consideration not to be overlooked in deciding as to the reasonableness of the minimum limit for volatile oil which I have recommended for adoption.

The following tables, with prefixed explanatory notes, give the results of work on samples specially obtained for this examination.

In July last I addressed the following circular letter to some ten or twelve of the leading importers of Canada :

" Dear Sir :

" This laboratory is desirous of making a study of cloves (clous de girofle) for the purpose of determining certain characteristics of this spice, which has never been as carefully studied as it deserves, and regarding which very little information is on record.

" It is desirous to procure half-pound samples of as many separate importations of the whole spice as possible. Will you kindly furnish such samples, representing as many different grades of the spice, as you can and send memo. of price with the same? If you have samples of exhausted or partially exhausted cloves, these also are desired.

" It will be understood that these samples are not collected in the ordinary way ; nor is it intended to publish the names of those who furnish them."

Nearly, or quite, all of those asked sent one or more samples, and twenty-eight (28) samples were received. These represented the following grades, as described by the importer.

Penang cloves	8 samples.
Amboyna cloves	3 "
Zanzibar "	13 "
West Coast "	1 "
Not named	2 "
Stems	1 "
Total	28

The following table gives the results of analysis of these samples; and it is to be observed that *moisture* has been determined by drying the ground sample over sulphuric acid *in vacuo* for 24 hours: the *Total volatile matter*, by exposing the ground sample to a temperature of 98° C. for 18 hours; and the *Total extractive matter* by treating the dry substance wirh petroleum ether in a Soxhlet tube. All these operations were carried out in duplicate and closely agreeing results were obtained.

Care was taken to grind all the samples to the same degree of fineness.

The column headed *Quality* contains a number obtained as follows. I carefully examined all the samples of each kind by spreading on paper, and taking into consideration the following physical characters:

1. Colour.
2. Size.
3. Plumpness.
4. Retention of so-called 'bud.'
5. Freedom from stems, etc.

The best samples of each kind I have graded as 1st quality: the worse ones as 2nd quality; and in a few cases, being unable with certainty to assign to either of these grades, I have given the number 1½. It is to be noted that this classification or grading was made quite independently of the results of analysis and it is interesting to observe how the physical characters of the whole clove give a suggestion as to its chemical characters.

Penang Cloves (Whole).

Number.	Moisture.	Total volatile matter.	Volatile oil	Total extractive matter.	Fixed oil.	Quality.	Remarks.
1	5·0	21·2	16·2	28·2	12·0	1	
2	7·4	24·0	16·6	27·0	10·4	1	
3	5·8	20·7	14·9	24·4	9·5	2	Off colour and resembled Zanzibar samples.
4	5·2	22·4	17·2	27·1	9·9	1	
5	6·9	21·7	14·8	26·5	11·7	1	
6	6·9	23·2	16·3	28·1	11·8	1½	A few stems.
7	7·1	24·3	17·2	28·2	11·0	1	
8	5·5	21·6	16·1	26·2	10·1	1	
Mean.	6·2	22·4	16·2	27·0	10·8	....	

Ratio of volatile oil to fixed oil = 100 : 67.

Amboyna Cloves (Whole).

Number.	Moisture.	Total volatile matter.	Volatile oil.	Total extractive matter.	Fixed oil.	Quality.	Remarks.
9	6·7	25·9	19·2	29·2	10·0	1	
10	5·5	23·5	18·0	26·7	8·7	1	
11	6·0	24·3	18·3	26·5	8·2	1	
Mean.	6·1	24·6	18·5	27·5	9·0	....	

Ratio of volatile oil to fixed oil = 100 : 49.

Zanzibar Cloves (Whole).

Number.	Moisture.	Total volatile matter.	Volatile oil.	Total extractive matter.	Fixed oil.	Quality.	Remarks.
12	5·1	22·4	17·3	25·3	8 0	1	
13	6·0	24·3	18·3	28·1	9·8	1	
14	5·4	22·9	17·5	27·0	9·5	1	
15	5·7	18·4	12·7	21·3	8·6	2	Stems and shrunken buds.
16	6·3	22·9	16·6	26·3	9·7	1	
17	5·7	22·1	16·4	26·1	9·7	1	
18	6·5	18·6	12·1	22·3	10·2	2	Like No. 15.
19	6·5	21·0	14·5	25·2	10·7	2	" No. 15.
20	6·2	23·6	17·4	27·8	10·4	1	
21	4·6	22·1	17·5	..	..	1	
22	4·1	21·4	17·3	..	..	1	
24	6·7	20·8	14·1	..	..	1½	Stems.
26	5·8	21·1	15·3	..	..	1½	"
Means	5·7	21·7	16·0	25·5	9·6	..	
Omitting Nos. 15 and 18..	5·7	22·2	16·5	26·8	10·3	..	

Ratio of volatile oil to fixed oil=100 : 59. Ratio (omitting samples 15 and 18)=100 : 62.

Unclassified Cloves (Whole).

Number.	Moisture.	Total volatile matter.	Volatile oil.	Total extractive matter.	Fixed oil.	Quality.	Remarks.
23	7·5	17·4	9·9	..	..	2	'West Coast' cloves.
25	6·9	21·9	15·0	..	..	1	
27	4·4	16·7	12·3	..	..	2	
28	7·5	13·4	5·9	..	..	..	Clove stems.

It is to be noted that—so far as those samples are concerned which would grade *Number 1* on the basis of their physical properties, the maximum and minimum percentages of volatile oil are as follows :—

	Maximum.	Minimum.	Mean.
Penang	17·2	14·8	16·2
Amboyna	19·2	18·0	18·5
Zanzibar	18·3	16·4	16·0
Mean, for a mixture of the three kinds in equal weights	18·2	16·4	16·9
Values found by Clifford Richardson	18·89	10·23	15·63

The lowest value for volatile oil which I found for any *whole clove*, claiming to be genuine, is 12·1 in No. 18 (Zanzibar). I am certain that neither this sample, nor numbers 15, 19, 24, 23 or 27, would be considered other than low grade by dealers who are in the habit of handling cloves.

I am therefore of opinion that no sample of cloves claiming to be of good quality should yield less than 14 per cent of volatile oil when assayed by the methods which I have described. If total volatile matter is determined by treatment with petroleum ether before drying at 98° C.—this treatment being repeated as described on page 167—the minimum volatile oil found should be 16 per cent by weight.

I respectfully submit the foregoing for your consideration, and remain.

Your obedient servant,

A. McGILL.